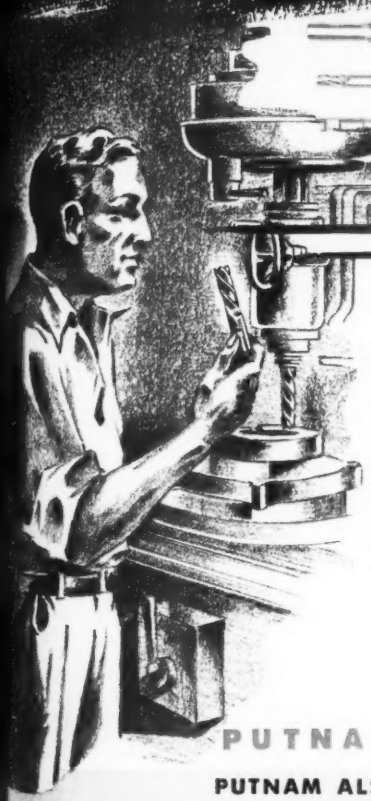
MARCH, 1945

20,000 COPIES

TOOL & DIE JOURNAL

TOOLING AND PRODUCTION

Preferred . . . FROM MACHINE TO FRONT OFFIC



"YOU NEVER HAVE TO 'BABY' THESE TOOLS"

"YOU CAN REALLY get the work out with a Putnam End Mill on this machine. You don't worry about the speeds and feeds that can easily 'blow up' other types of milling cutters. These tools really get in there and cut . . . and keep on cutting."

Skilled machine operators know their cutting tools. Through the use of Putnam Hi-Speed End Mills, thousands of them have definitely seen their work improved and completed more quickly. In innumerable instances it has been because of their expressed preference for these tools that many plants use Putnam End Mills exclusively.

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PUTNAM ALSO PRODUCES

CONTINUOUS PILOT COUNTERBORES

SPIRAL FLUTED CHUCKING REAMERS

ARMY E NAVY

PUTNAM TOOL COMPANY

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WHEN THE FLAMES DIE DOWN OVER THERE—
what happens over here?

ON one thing we're all agreed—the lights of industry in this country must die down as little and as briefly as possible, in the turnback to peace. Getting tools and dies ready—knowing how you'll start, what products you'll make, what materials you'll need—those are patriotic as well as economic necessities *now*, without taking away at all from the first importance of the war.

In working your problems of redesign and new design, when you come to the matter of materials, that's where we can be of help. Remember that the function of Allegheny Metal, pioneer stainless steel in America, is always to *improve:* strength, service life, cleanliness, appearance—whatever means most in your market. Call on us for any assistance you need—either in using Allegheny Metal, or in your tool and die steel problems.

MERITS OF ALLEGHENY METAL

- Great strength, retained at extremes of heat and cold.
- Tough and impact-resistant.
- Favorable strength-weight ratio.
- Highly corrosion-resistant.
- Inherent, lasting beauty.
- Easy to form and weld.

ALLEGHENY LUDLUM STEEL CORPORATION
Brackenridge, Penna.

ALLEGHENY METAL
The Time-Tested Stainless Steel

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ALSO HANDLED AND STOCKED BY ALL JOSEPH T. RYERSON & SON, INC., WAREHOUSES

SPECIFICATIONS:
1" collet capacity, 9" swing, 16" center distance, sixteen spindle speeds from 27 to 1750 r.p.m.

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High Speed Precision
TOOL ROOM LATHE

When tool room collet work with one inch diameter or less is done on heavy lathes designed to produce large work, here is what happens—time is lost, machines lose money by under-capacity production, excess power is consumed for the work involved and floor space is wasted.

For profits proportionate to machine investment, use the proper size tool room lathe comparable to the work involved.

To have complete information on a precision machine designed for speedy turning, boring and threading, obtain a copy of our bulletin illustrating and describing the above unit.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

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The Tool & Die Journal is published monthly for those industry key men who are responsible for designing, building and using precision tooling.

CBI Controlled Circulation —CBI Coverage Official Publication: The Tooling Institute

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IN THE ARMED FORCES:
CHARLES H. HAYNES
DON E. ROOT

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PUBLICATION MEMBER

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fibro forged SOCKET SCREWS

√ Completely Cold Forged

√ EXCLUSIVELY HOLO-KROME

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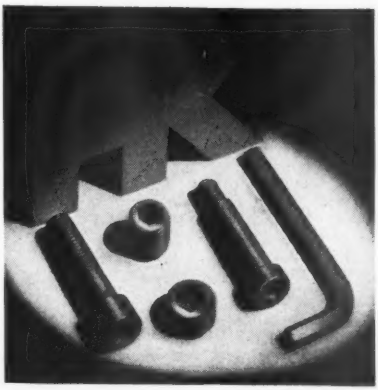

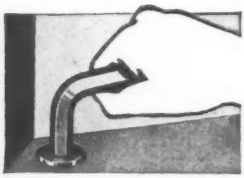

QUICK and POSITIVE INTERNAL WRENCHING . . . .

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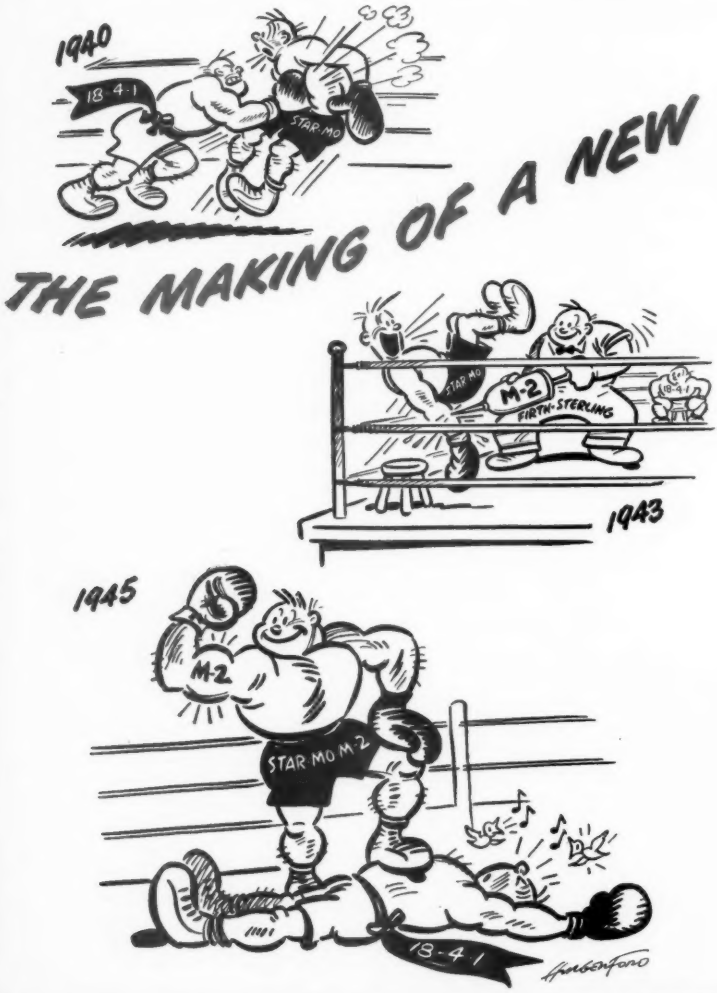
THE BETTER FASTENING METHOD


1940
18-4-1
STAR MO
THE MAKING OF A NEW
M-2
FIRTH-STERLING
1943
1945
M-2
STAR MO M-2
18-4-1

HIGH-SPEED CHAMP!

STAR-MO M-2

Improved

TUNGSTEN-"MOLY" HIGH-SPEED STEEL

Ever since the new "M-2" analysis was adopted for tungsten-molybdenum high-speed steel, more and more manufacturers in the automotive and tool-making fields are recognizing with approval and satisfaction this new Firth-Sterling champion, STAR-MO M-2.

They have seen this new steel in action. They find it excels 18-4-1 in their plants. They are supporting it with enthusiasm because it is giving satisfactory performance continually, and adding new accomplishments to its record. Why not give STAR-MO M-2 a try-out in your shop?

STAR-MO M-2 is *Better*

Outcuts and outlasts 18-4-1 high-speed steel on most applications.

STAR-MO M-2 *Costs Less*

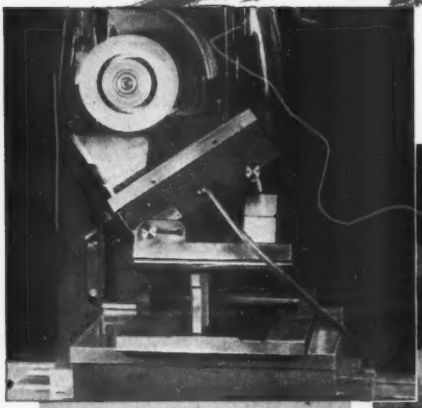
Base price is 14% less than 18-4-1 steels and weight is approximately 7% less per foot. Let us quote.

STAR-MO M-2 is *Easy to Handle*

Call in a Firth-Sterling Representative to discuss applications, heat-treating methods and practical advantages.

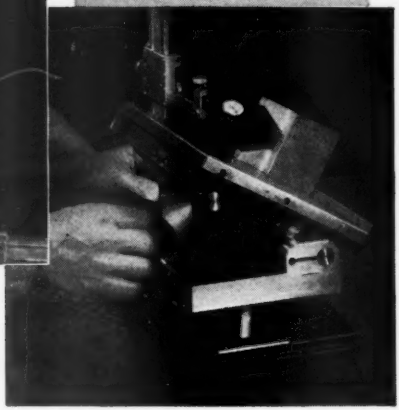
Firth-Sterling STEEL COMPANY

Time-Savers IN EVERY TOOL ROOM



The MAGNA-SINE

The Robbins SINE PLATE



For holding any magnetic material at any angle, single or compound, quickly and securely, but without distortion. The part is held and released instantly by the turn of a switch. There is no pressure to cause slippage. The angle is set by gage blocks and this, combined with the accurate, sturdy construction of the Magna-Sine itself, assures a precision set-up.

The Magna-Sine will save hours on every type of angular set-up. Use it for grinding, milling, drilling, boring or any other operation where the work must be held rigidly and accurately at any angle.

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The Magna-Sine and the Robbins Sine Plate will meet nearly every angular holding requirement in the tool room. Get the details on this time-saving, money-saving, work-improving method. Call your nearest Robbins representative or write directly to the factory.

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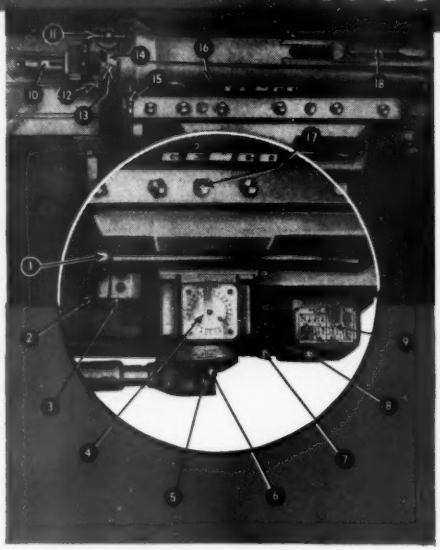
for Simple, Speedy, Economical Operation of

GEMCO SHAPERS

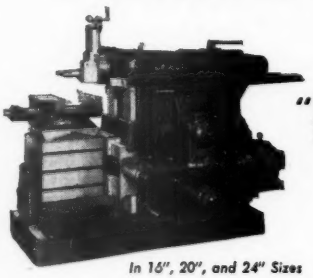


Check these 18 handy controls of the GEMCO Shaper. Note how they are all arranged for greatest convenience to the operator. This simplifies and speeds up the work—and cuts costs.

1. Main control lever for ram movements.
2. Electric switch lever for control of rapid traverse motor.
3. Start and stop buttons for drive motor as furnished with rapid traverse machines.
4. Stroke indicator dial & pointer, direct reading.
5. Shaft for operating stroke adjusting mechanism.
6. Feed adjusting lever and dial, direct reading.
7. Shift lever for high speed gears of transmission.
8. Shift lever for back gears of transmission.
9. Ram speed selection chart, indicating relative position of shift levers (7 & 8).
10. Tool post and clapper box of tool head.
11. Feed spindle lever of tool head.
12. Locking device for tool slide.
13. Adjusting screw for gib of tool slide.
14. Tool head base, graduated.
15. Stud for operating clamping means of tool head.
16. Stud for operating ram positioning spindle.
17. Inspection fitting for lubrication of ram gib.
18. Lever for clamping rocker arm linkage to ram.

Write today for Bulletin GC-12D

GEMCO Multi-Purpose SHAPERS



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—the Superior Cast Alloy for Metal Cutting Tools

Men and material on way to Luzon — Official Coast Guard Photo

for the tools of war

America's revived war production program demands the greatest possible output from every machine tool every working day.

Latrobe RED ARROW, the Superior Cast Alloy, is ideally adapted to those cutting operations where speeds are required beyond those obtainable with ordinary cutting steels.

Yet Latrobe RED ARROW will function at these higher speeds even with old equipment without danger of breakage . . . and with far less wear . . . consequently, with greater savings in production time!

These Latrobe Red Arrow Inserted Blades help speed production. Used in this boring bar, four times the pieces per grind were produced, compared with previous cast alloy used.

If you have a problem involving cutting or die steels, a Latrobe Service Engineer will be glad to help 'Phone or write

Latrobe ELECTRIC STEEL COMPANY

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Series "N"

NEW AND IMPROVED JACOBS

"AN INSERTED BALL RACE HAS BEEN ADDED"

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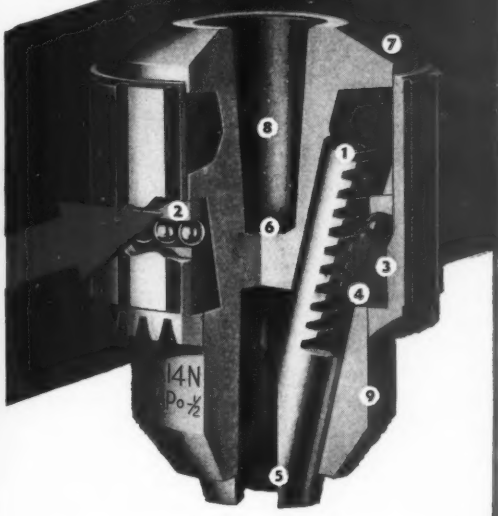
"THE NATIONAL STANDARD FOR Post WAR PRODUCTION"

SUPER CHUCK



Check THESE CHUCK IMPROVEMENTS:

1. [redacted]
2. [redacted]
3. [redacted]
4. [redacted]
5. [redacted]
6. [redacted]
7. [redacted]
8. [redacted]
9. [redacted]

carrying capacity (feature 4) . . . fifteen percent more thread contact (feature 1) for corresponding additional strength.

The Jacobs "N" Series Super Chuck has already elicited enthusiastic responses from prominent users in all branches of Industry. Make sure that your heavy duty specifications include this newly improved model. Write for the new Bulletin 31-T.

The Jacobs Manufacturing Company,
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Fifty Hardened Steel Rings Per Hour

A manufacturer faced the task of drilling 1 9/64" holes in production of 4" steel rings—hardened to 65 Rockwell "C" and carburized on one side to a depth of 3/16".

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"HARDSTEEL" drills in thousands of plants are drilling steels hardened by any process and saving money on both production and parts recovery operations.

Write for your copy of the "HARDSTEEL" Operators Manual.

Also inquire about "HARDSTEEL" as a metal for special parts that must meet unusual conditions of service.

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When the war broke out, ***Knock-Out*** Tool Grinders were ready! They've been doing a Titan's job on production work and on tool maintenance throughout the nation and all allied countries. Now as the peace approaches, and thinking men are readying their plants for the tremendous production job which lies ahead, ***Knock-Out*** Grinders are again ready to accept the challenge!

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When writing for literature ask for Unit No. 36-35

K. O. LEE CO.
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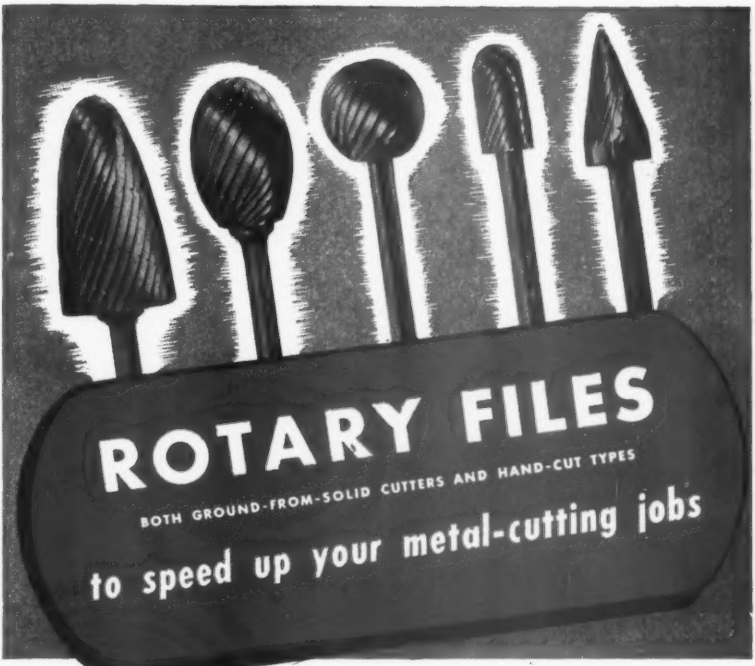

DESIGNED FOR USE on flexible or stationary shafts, filing machines, portable electric and air tools and similar devices, Heller Rotary Files are high-speed production tools. They meet your needs for the faster cutting of metals, plastics and other materials.

The shapes obtainable satisfy every requirement. They range from cylindrical with flat or radius ends, spherical, elliptical and tree shapes to conical, flame, reverse-angle, semi-spherical convex, concave and other designs. Three cuts,—coarse, medium and fine.

Tell us your particular rotary file problem. Our engineers will be glad to cooperate in helping you solve it.

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for SPEED and EFFICIENCY

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Skillful piloting of a ship past hidden rocks and dangerous shoals, safely

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of jigs
• gauges
• fixtures
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• special
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Skillful piloting of a ship past hidden rocks and dangerous shoals, safely into port, can be likened to expert designing of tooling equipment.

Through expert tool engineering a manufacturer reaches his objective—the fast, economical production of parts that contribute greatly to safe and profitable operation.

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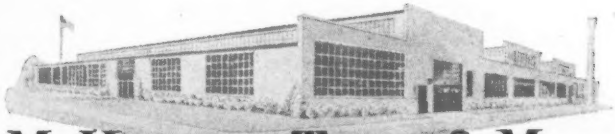
We are grateful to have enjoyed the confidence of outstanding manufacturers for many years in the engineering of tooling equipment and we are sure that our record will enable us to successfully complete any important contracts that you may have to place.

Phone, wire or write us for an interview.



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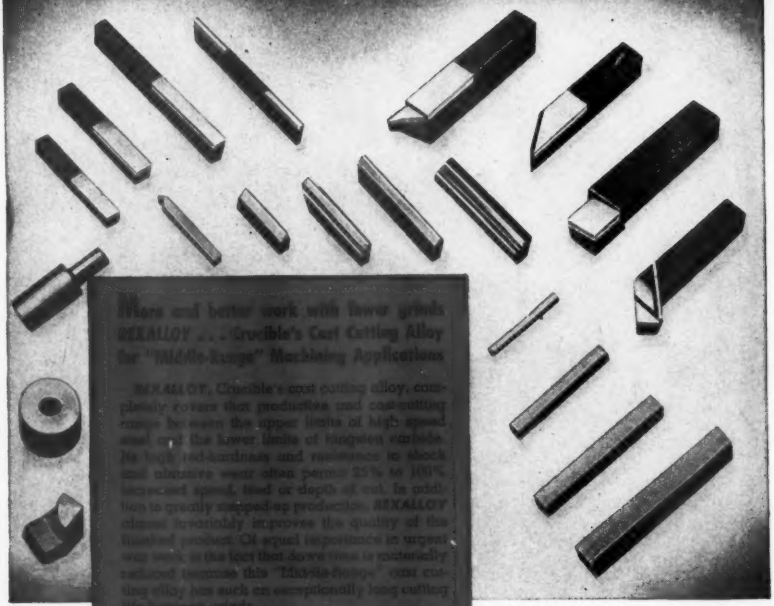

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for "Middle-Range" Machining Applications

REXALLOY, Crucible's cast cutting alloy, completely covers that productive and cost-cutting range between the upper limits of high speed steel and the lower limits of tungsten carbide. Its high red-hardness and resistance to shock and abrasive wear often permit 25% to 100% increased speed, feed or depth of cut. In addition to greatly expedited production, REXALLOY almost invariably improves the quality of the finished product. Of equal importance in unprecedented work in the tool room is materially reduced because this "Middle-Range" cast cutting alloy has such an exceptionally long cutting life between grinds.

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☐ We would like to discuss the possible use of REXALLOY in our plant.

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NATIONAL

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To maintain their accuracies (to millionths of an inch) longer, each Ellstrom Gage Block's gaging surface is chromium plated—this not only gives you longer wearing millionths in laboratories but also on production checking operations.

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M-34 VERTICAL SPINDLE

NEW POWERFUL ACCURATE GRINDER

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Write for complete information and specifications in new Bulletin.

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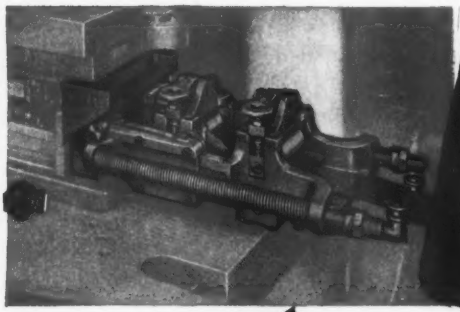
ABRASIVE MACHINE TOOL COMPANY • EAST PROVIDENCE 14, RHODE ISLAND



The Dickerman Die Feed

1. Handles coiled stock up to 3/16" thick, widths up to 4".
2. Accurate, automatic; cuts labor time and material waste.
3. Adjustable from 0" to its maximum feed length in increments of .001".

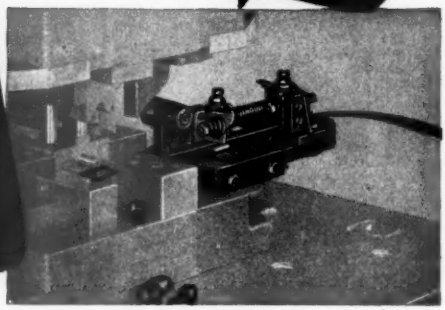
Send for booklet

The Dickerman Hitch Feed

1. Offers positive feed control, adjustable from 0" to its limit.
2. Feeds from any position on any style die.
3. Requires no connection to power shaft.

Made in two sizes, 2" and 4" Feeds

Send for booklet



YOUR PUNCH PRESS —

***Works* more hours each shift with a Feed attached to each Die**

Set-up time for both feed and die is no longer than for die alone. With either the Dickerman Hitch Feed or Die Feed, the first cost is so low that you can easily have one for each of your frequently-used dies.

We Do Some Sub-Contracting

Frequently part of our facilities are available on sub-contract basis to manufacturers who need fine workmanship. We welcome such inquiries from firms whose product is essential to the war effort, and which will command an essential market after the war is won.

H. E. Dickerman Mfg. Co.

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WE ARE LOOKING FOR TROUBLE

Trouble like the Junior Toy Company of Hammond, Ind., had in making the 20-lb. fragmentation bomb.

They make bombs today so our children can have toys tomorrow.

TROUBLE

Excessive breakage first operation; overheating, galling, and scratching on subsequent operations. Daily removal of dies for honing and stoning.

SIZE OF WORK

Base 3¾", Flange ⅜", Cup Draw 3" x 1¼" Depth. Upper Flange 1¾" Dia. Total Depth of Draw 1¾".

MATERIAL

Seven gauge hot rolled, pickled and oiled strip steel. Blank 5¾" Dia.

ANALYSIS OF TROUBLE

To find lubricant that would avoid breakage and building up a shoulder in the reverse bend of the upper flange.

RESULTS WITH KONDOR DRAW

Breakage immediately eliminated and production continued satisfactorily for several weeks with no die troubles as before.

Call a Kondor Engineer today

7th OF A SERIES

WRITE TODAY FOR FREE SAMPLE

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CORPORATION

INDUSTRIAL PROCESSING CHEMICALS

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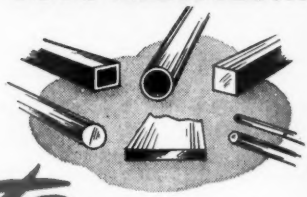
Canadian Associate: ALLIED INDUSTRIAL EQUIPMENT CO., ... TORONTO, ONT.

SPECIFICATIONS
WELLS No. 8

CAPACITY: Rectangular . 8"x16"
(Special Guides) . . 5" x 24"
ROUNDS: . . . 8" diameter
MOTOR: . . . . . ½ H. P., current optional
SPEEDS: . Selective 60, 90, 130 feet per minute
WEIGHT: . . . . Approximately 750 pounds

CUTS METALS...



CUTS *Costs* TOO!

There's no doubt about it. For economical metal cutting, this Wells No. 8 is hard to beat. Because of its flexibility you can use it for your odd cutting jobs and free large production units for other work.

It cuts quickly, and with a minimum of labor. The quick acting vise handles odd shapes without special fixtures. It's accurate. And, it affords a substantial material saving as the saw removes only 45 thousandths of an inch of material.

Another reason why the Wells cuts costs is its portability. You save time and labor by moving the saw to the work.

Thousands of Wells Metal Cutting Band Saws are working in busy plants. Check up. You'll find a spot in *your* plant for a Wells No. 8.

Wells SAWS
THE SIGN OF SUPERIOR SAWS
Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
1940 ASH STREET, THREE RIVERS, MICH.

Vispeed

IS LIKE AN EXTRA MAN IN THE SHOP

Converts standard bench or swivel vise to fast, safe automatic production tool.

VISPEED eliminates awkward hand clamping — leaves both hands of the operator free. No need of a second operator to help handle clumsy parts, or to position parts to close register. Vispeed uses flexible air power, foot controlled, as the clamping force. Clamping force is adjustable from zero to two and one-half tons. Vispeed is safe. Jaws open to full standard capacity but air-powered movement is limited to 1".

Vispeed permits a flexibility in vise use that is amazing. Vispeed works so smoothly, so safely, so easily, that women operators can handle job after job formerly beyond their strength. Vispeed means faster, safer, better production in any shop.

The Bellows Co.

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Save production time with a

SHOPLIFTER

One man can handle heavy dies alone.

Not necessary to stop other machines to get help.

More production per day from your machines if a Shoplifter is handy to do the heavy job of moving dies from storage racks to the press. In these times when maximum production of machines is of vital importance, much time and labor can be saved if the operator can handle the heavy work of changing dies without calling for help from other operators.

The Shoplifter is built for this job. Dependable and safe with a rated capacity of 500 lbs. (heavier machines up to 5000 lbs. can be furnished). Entire machine built of structural steel. Electrically welded throughout. Steel platform 24" x 24", lifts 54" above floor and lowers to within 4⅞" of floor. Overall height 72". Crank, up and down, hoist unit.

Prompt Delivery . . . Price $147.50. Full freight allowed

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To Speed Assembly, Machining Operations, Metal and Plastic Stamping.

For complete data, including tested pressure figures, send for the new Kwik Klamp Catalog.

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CHICAGO GRINDING WHEELS AND MOUNTED WHEELS

Chicago Wheel takes pride in providing you with exactly the wheel you need, for exactly the job you have, to give you exactly the finish you want!

There's half a century of experience behind this, fifty years of specializing on grinding wheels—grinding wheels with hundreds of varieties in shape, size, abrasive and bond formulas, engineered for the right tool speed and work pressure.

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TRY ONE FREE—A Chicago Mounted Wheel or an FV Bond Grinding Wheel sent promptly on request. Tell us size preferred and what you have to grind. Send for Illustrated Catalog.

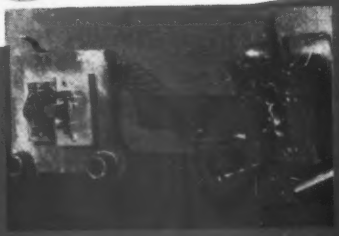
CHICAGO GRINDING WHEELS
For the duration, sizes up to 3" in diameter only, in various bonds including FV, the bond with a pedigree.

CHICAGO MOUNTED WHEELS
For internal or external grinding, burring and polishing. Made to fit any tool. Many styles, shapes and shank sizes.

CHICAGO WHEEL & MFG. CO.

1101 W. Monroe St., Dept. TD **Chicago 7, Ill**

These punches made of *Graph-Mo Steel* produced *140,000* extra pieces . . . .



These punches were made from Graph-Mo Steel by the Precision Manufacturing Company of Philadelphia, Pa. for John J. Nesbitt, Inc., and are used in a progressive set up that produces 2,000 blanks an hour. Before the punches were made of Graph-Mo Steel breakage was a serious problem and the maximum life was 10,000 pieces. Punches made of Graph-Mo produced 100,000 to 150,000 pieces before needing attention and none broke in service.

In addition to providing 700 extra hours of service Graph-Mo, because of its excellent machinability saved 30% in machining time.

When you want long tool and die life and increased production specify Graph-Mo an oil hardening steel or one of the five famous Timken Graphitic Steels. They all have good machinability, are very responsive to heat treatment and offer stubborn resistance to wear and abrasion. A request on your firm's letterhead will bring a 48 page book that tells how and where to use these performance proven steels. Steel and Tube Division, The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
GRAPHITIC STEELS

TURNER PLAST-O-LOCK

(Patent Applied For)

GAUGE SAYS

on its NOT GO member!

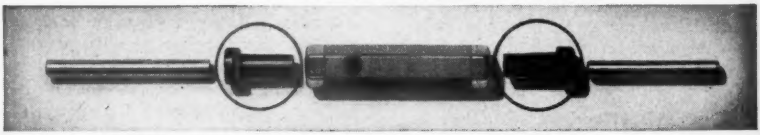
Here's another first by Turner—a *red* plastic collet to more quickly identify the "not go" member of your plug gauges! Plast-O-Lock gauges are great time savers wherever they are used.

Turner's Plast-O-Lock (patent applied for) collet type plug gauges are not only easier to use but they will multiply the life of plug gauges many times. The reason for this is obvious. Because Plast-O-Lock features a collet of plastic, slotted and tapered to fit into the tapered end of a standard plastic handle, it is possible for the gauges to be held securely without their surfaces being scratched or burred, thereby allowing use of most of the gauge's length. For example, as the "go" and "not go" ends are worn beyond allowed tolerances they are simply cut off, thus leaving an unused end ready for gauging. To illustrate further, if a boring no deeper than ⅛" is being checked, as many as 8 fresh gauging sections may be obtained from one standard length "go" gauge as furnished with Turner's Plast-O-Lock. This obviously eliminates the necessity of salvaging used gauges.

For full particulars about Plast-O-Lock gauges wire or write us today.

★ *Features* ★

1. Multiplies the life of the plug gage.
2. Collet will not mar a lapped or polished surface.
3. Used with plastic handle the gauge has a more sensitive feel in the hands of an inspector.
4. Is easy to make length adjustment because slot is provided for end wrench.
5. Plast-O-Lock size range from .050 to .690.
6. Red plastic collet for quick identification of "not go" members.

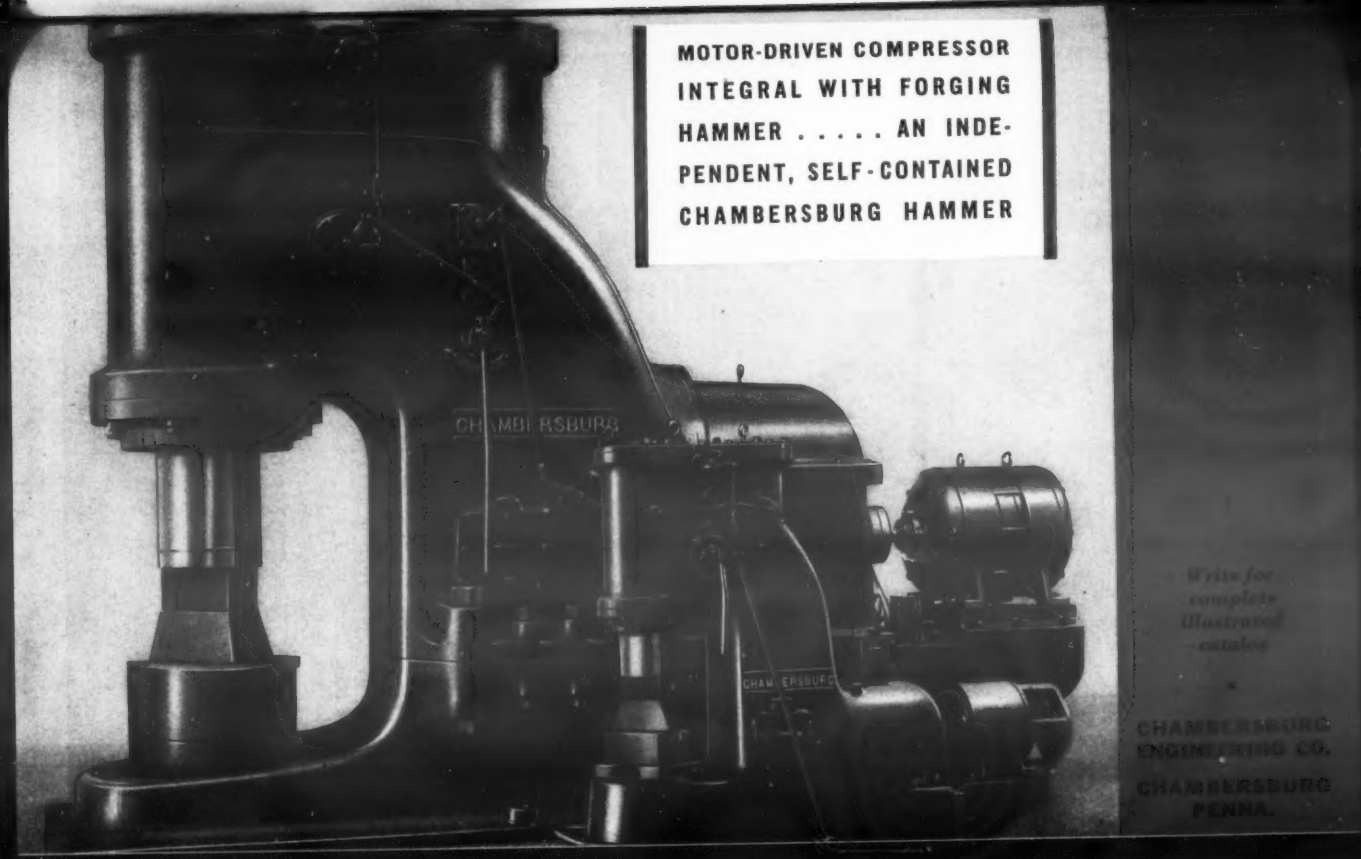


TURNER BROTHERS

DELIVERY Fast delivery can be made on these Plast-O-Lock gauges as well as the following Turner gauges: ring, flush pin, snap and built up.

TURNER GAUGE GRINDING COMPANY

2625 HILTON ROAD • • FERNDALE 20 MICHIGAN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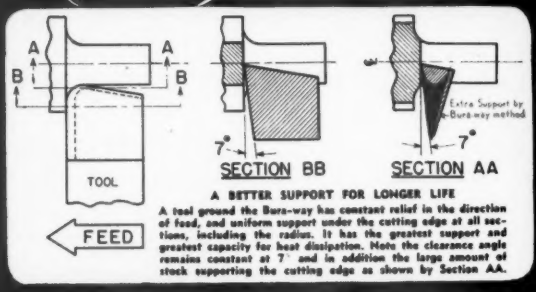
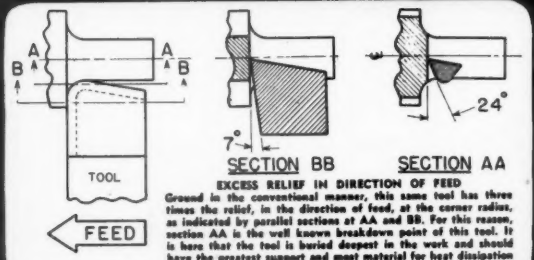
The NORTON BURA-WAY METHOD



A BETTER SUPPORT FOR LONGER LIFE

A tool ground the Bura-way has constant relief in the direction of feed, and uniform support under the cutting edge at all sections, including the radius. It has the greatest support and greatest capacity for heat dissipation. Note the clearance angle remains constant at 7° and in addition the large amount of stock supporting the cutting edge as shown by Section AA.

The Old Method



EXCESS RELIEF IN DIRECTION OF FEED

Ground in the conventional manner, this same tool has three times the relief, in the direction of feed, at the corner radius, as indicated by parallel sections at AA and BB. For this reason, section AA is the well known breakdown point of this tool. It is here that the tool is buried deepest in the work and should have the greatest support and most material for heat dissipation whereas actually it has the least support and the least material.

THE Norton Bura-way Grinder is more than an exceptionally well-designed machine for the precision grinding of single-point cutting tools. The Bura-way method—*grinding constant relief in the direction of feed*—provides the means of greatly increasing tool life. Hence your machine output is raised, spoilage of work reduced, and scarce tool steels conserved, thus eliminating unnecessary waste that by other methods has been unavoidable. Complete information on the Norton Bura-way Grinder on request—no obligation.

NORTON COMPANY

Worcester 6, Mass.

LISTEN BROTHER, IF YOU WANT TO BE SURE THAT YOUR MACHINE IS SETTING ON AN EVEN KEEL, THIS LITTLE LEVELING JACK WILL SET HER RIGHT FASTER'N YOU CAN BAT AN EYE!

Empco JACK

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If you're setting up machine tools, special machinery, large surface plates, large assembly fixtures or tool room and production equipment, etc., you can save time *now* and much re-leveling time *later* by using *EMPCO machine Leveling Jacks.*

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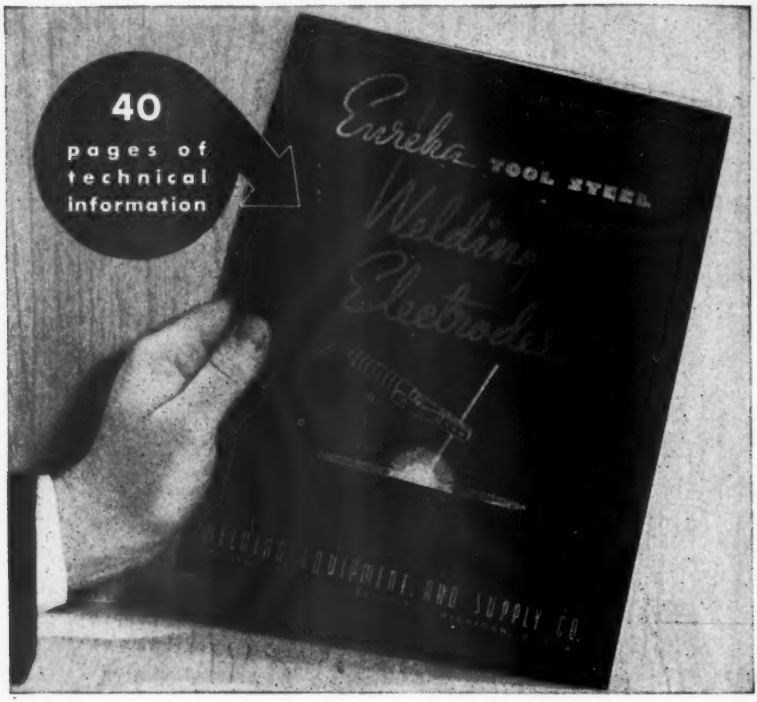

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It tells all about TOOL STEEL welding

★ This manual will help you save man-hours, conserve material and minimize production delays by outlining methods of repairing and compositely fabricating tools and dies, as well as correcting design and rectifying errors. Send for your copy of this manual today. It is fully illustrated with typical welding applications.

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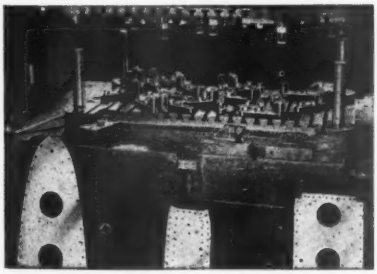
WHISTLER ADJUSTABLE PUNCH and DIE UNITS

Whistler Adjustable Dies work on any type press and because of their simplicity even new workers quickly learn to make pattern change-overs—increasing productive press hours. Absolute precision on short or long runs. Whistler design permits more perforations in a given area—often reducing press operations.

For quick and complete information on the advantages of Whistler Adjustable perforating and notching dies send a description or drawing of your work.



These pieces produced with Whistler Adjustable Dies clearly illustrate the re-use of same punch and die units.

These photographs show the simplicity of a Whistler Adjustable Punch and Die assembly. Every piece is interchangeable.

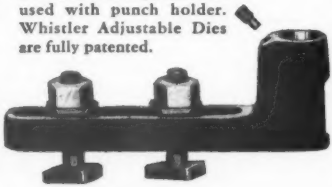
Self-locking bolts on punch holder drop into T slots of die shoe. Set-screw engages into recess at base of punch. Punch cannot turn or pull out in operation.

Punches of finest tool steel are machined to .0001″ tolerances.

Stripper unit fits smoothly over punch—no "wobble". Flushed set-screw engages into groove on punch body. Stripper or punch quickly removed when desired.

Grooved heads on dies make lifting from holder quick and easy. Like the punches, dies are held firmly into holder by set-screw in recess at base. Whistler *precision* is known the world over.

Die holder has self-cleaning slug chute. Special design bolt heads present two bearing surfaces to T slot channel—self-locking, same as used with punch holder. Whistler Adjustable Dies are fully patented.



Write for the Whistler Catalog—every Production Executive should have it.

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Over 25 Years of Tool and Die Making Experience

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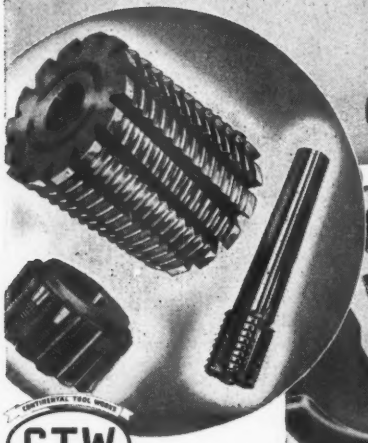

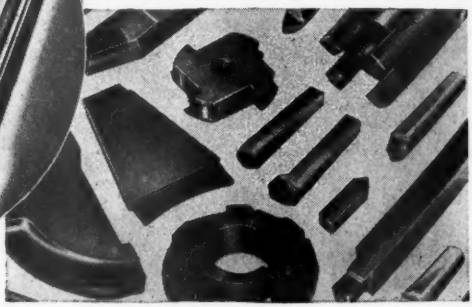

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Since 1919 The Continental Tool Works (a division of Ex-Cell-O Corporation) has been producing special and semi-standard cutting tools to customers' drawings or part prints—until today the Continental name in the cutting tool field is commonly used as another word for "accuracy and quality." This long experience, coupled with the most modern and complete facilities, makes Continental the first choice as a cutting tool source. *Find out now how Continental can help assure you of high production efficiency*—get in touch with your nearest Ex-Cell-O representative or write direct.

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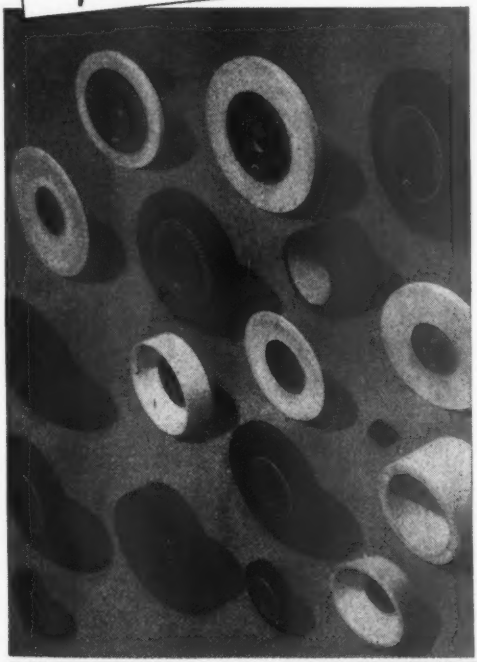

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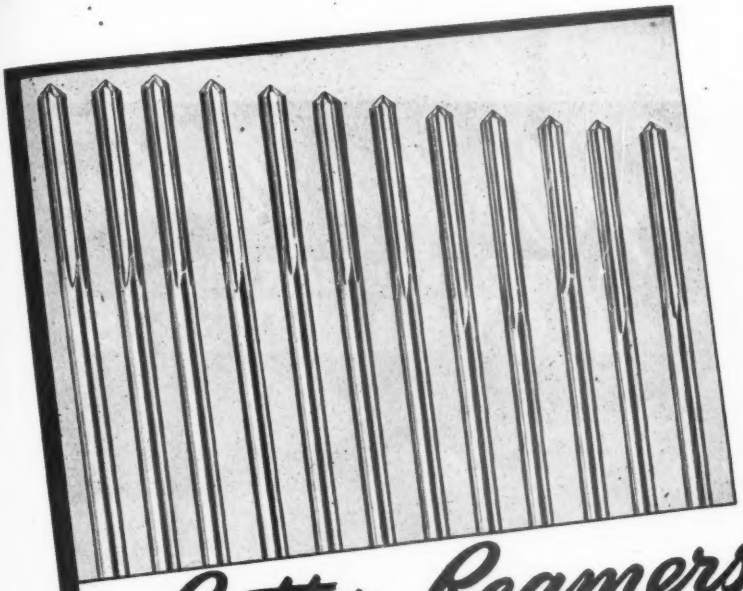

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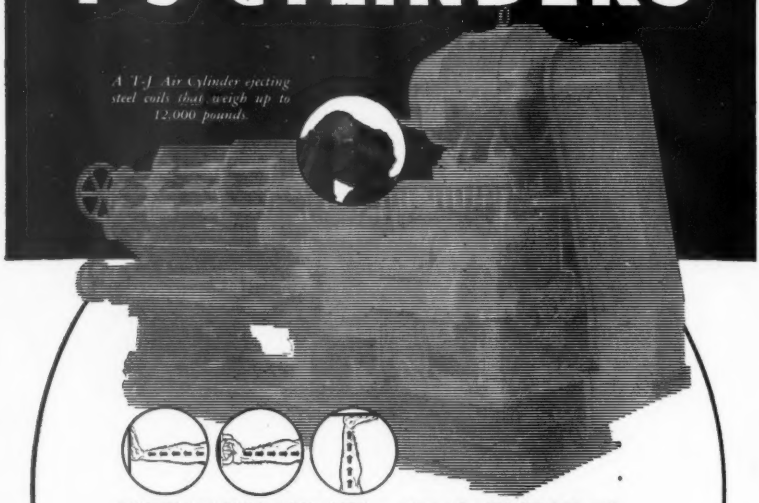
LAVALLEE & IDE, INC., CHICOPEE, MASS.

L&I GROUND FLUTE REAMERS

Simplify Your Machines

...SPEED PRODUCTION WITH

T-J CYLINDERS



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Passing this particular "ammunition" requires that you reappraise your own company's Payroll Savings Plan. Have your own War Bond Chairman contact the local War Finance Committee—today! They will welcome the chance to discuss this new program with you.

The Treasury Department acknowledges with appreciation the publication of this message by

Tool & Die Journal Staff

This is an official U. S. Treasury advertisement prepared under the auspices of Treasury Department and War Advertising Council

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The VINCO Master Inspection Dividing Head is now universally accepted as the most accurate final inspection instrument yet devised for checking the angular spacing of splines, gear teeth, master index plates, graduations, cams, etc. It is approximately seven years since the VINCO Dividing Head was introduced and today it is as well known in Russia, Australia and other countries as it is in the United States. We are naturally proud of this instrument, not only for its extreme accuracy (TWO SECONDS OF ARC OR TWO PARTS IN 1,296,000) but because it has been such an important factor in increasing the production of those vital parts, involving angular spacing, that are so essential in modern war materiel. We will welcome your request for more detailed information.

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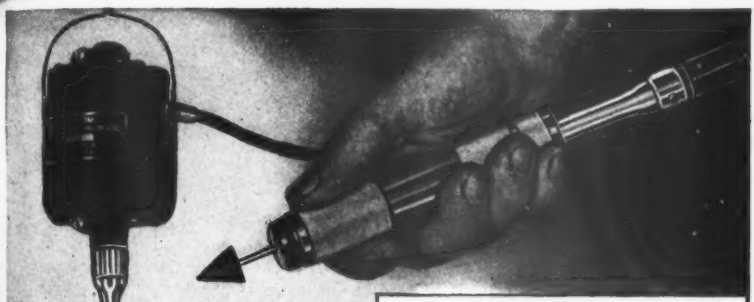
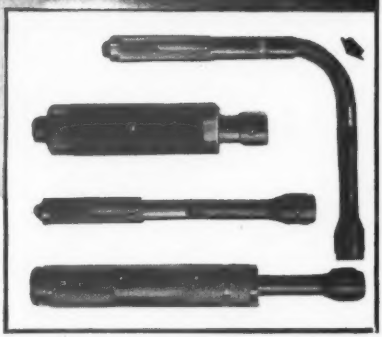


Choice of AMERICAN INDUSTRY for DE-BURRING and LIGHT GRINDING and FINISHING JOBS



Foredom Machines are employed in many thousands of manufacturing plants for grinding, finishing, polishing, de-burring, milling, cleaning, etc., replacing old-fashioned, time-killing hand methods.

Foredoms are used in 3 key departments—production—tool room—maintenance. Among the leading industrial plants employing Foredoms are Ford, General Motors, Chrysler, Nash-Kelvinator, Jack & Heintz, Sperry Gyroscope, Bendix, Westinghouse, etc.

Models from $17.50 to $48.75. Catalog No. 44 shows complete line and many uses—may point the way to solving some of today's production and maintenance problems. Write for your copy.

4 Quickly - interchangeable hand - piece types — pencil size and larger — some with flexible wrist — see arrow.

For maintenance and emergency needs,—touching up set-ups without disassembly, removing high spots on gears, identification marking of equipment, etc

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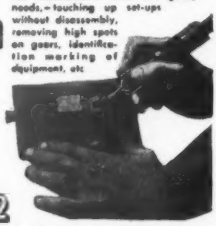
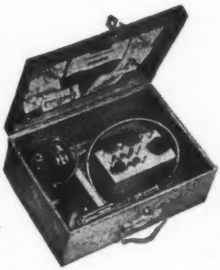


2

In die and tool departments, for grinding, finishing and touching up dies, molds, jigs, etc

3

For de-burring, grinding, finishing, polishing and other light production jobs—particularly valuable on irregularly-shaped parts



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Model 111

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SHARPENING METHOD

• INGENIOUS application of Dumore No. 5 Precision Grinder in grinding contour of milling cutter flutes.

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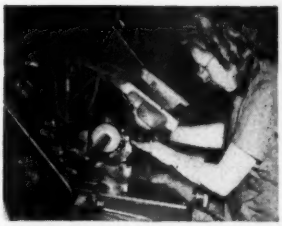

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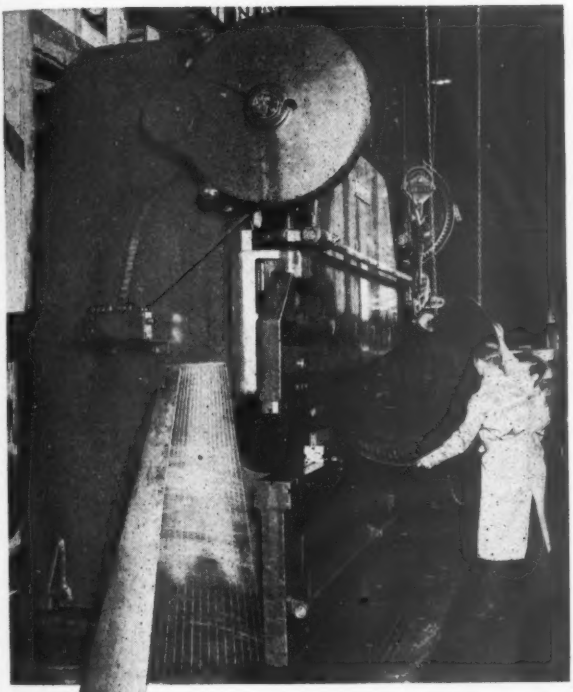

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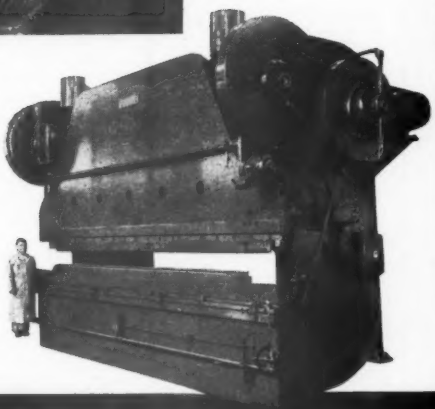

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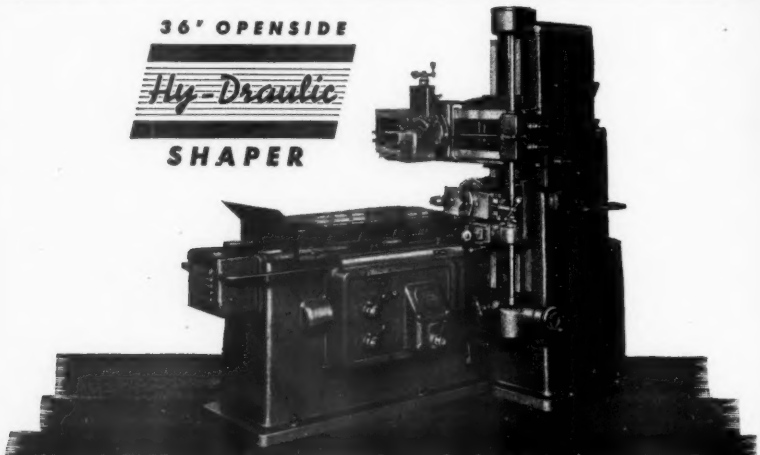

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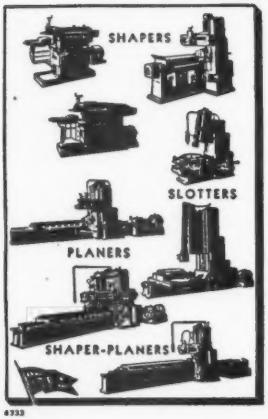

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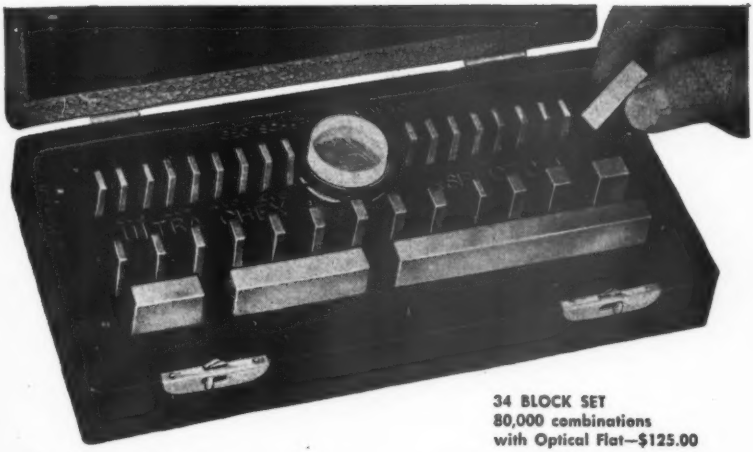

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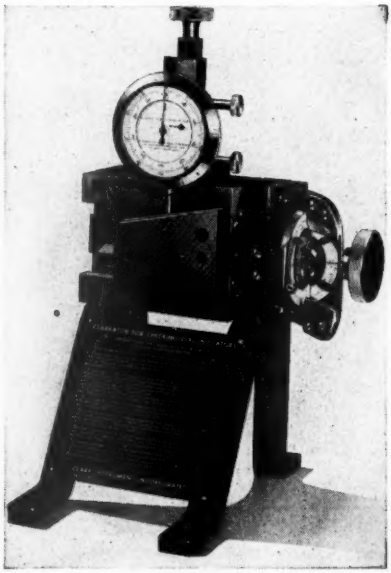

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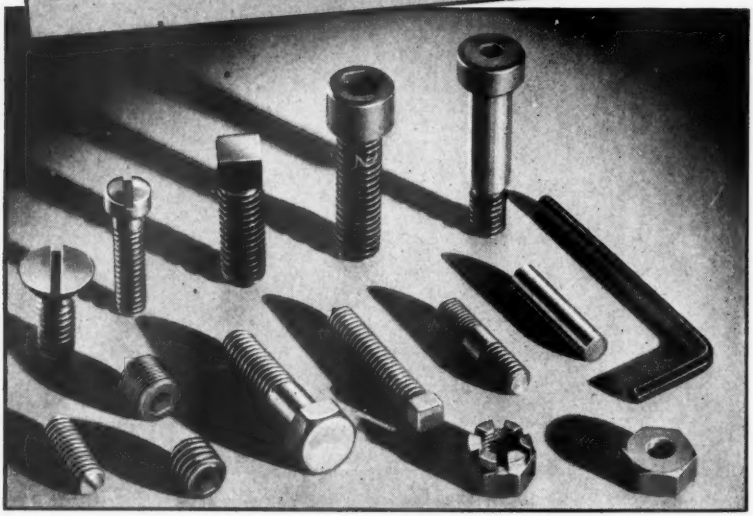

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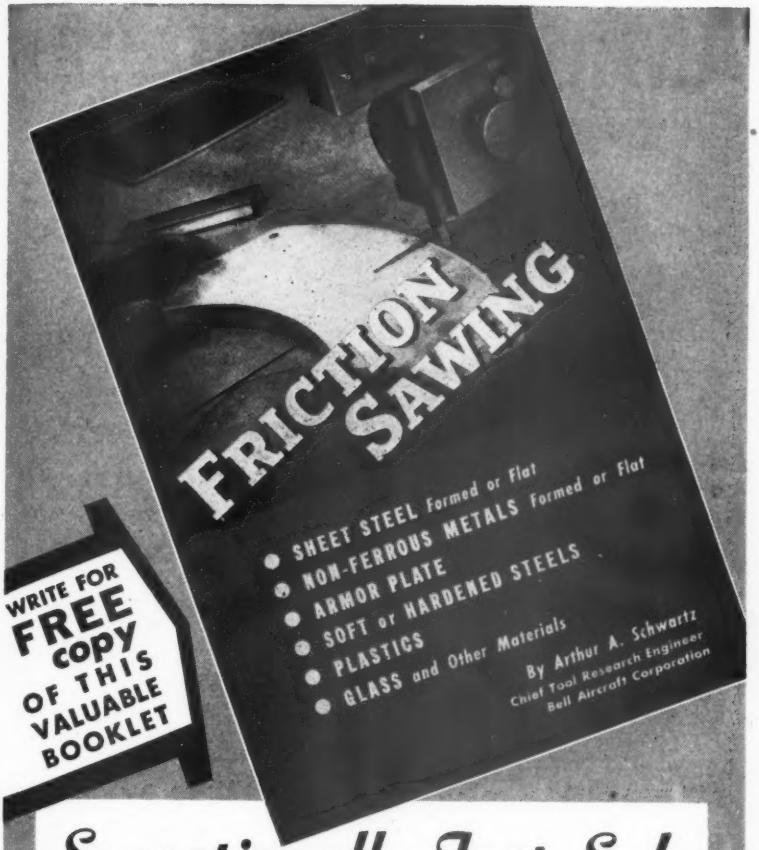
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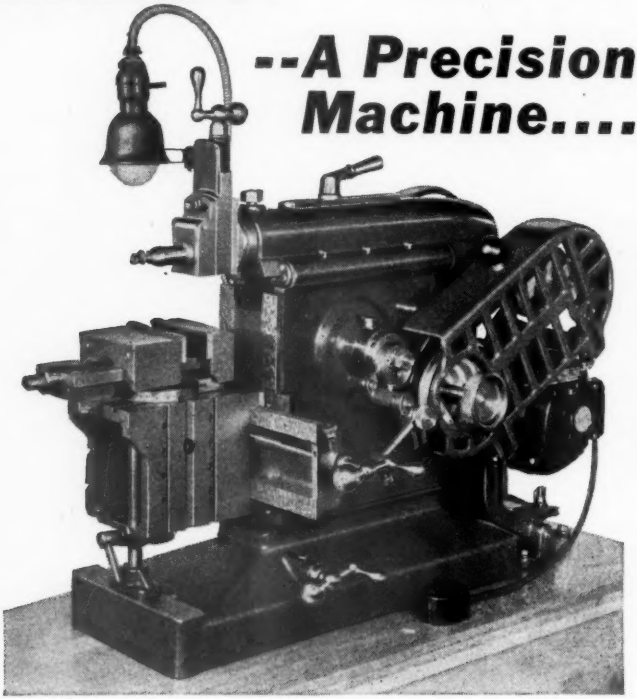

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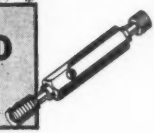

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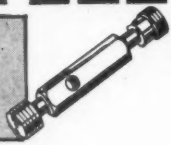
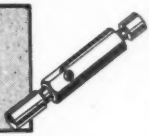


THREAD RING

TAPER PIPE RINGS

PLAIN PLUG



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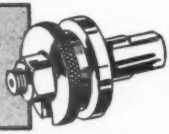

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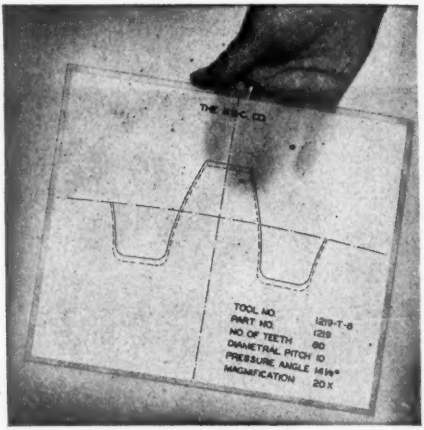

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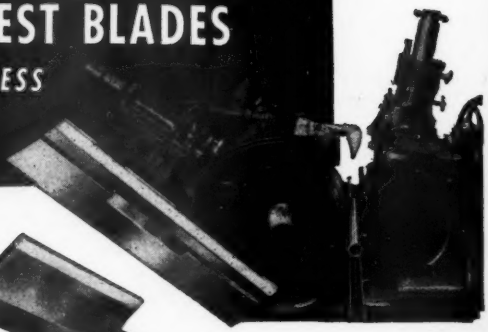

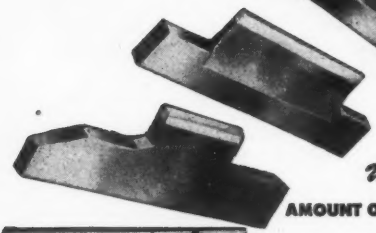

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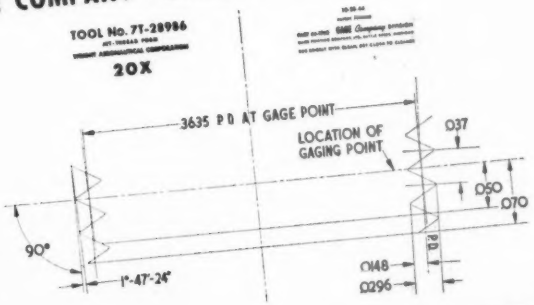

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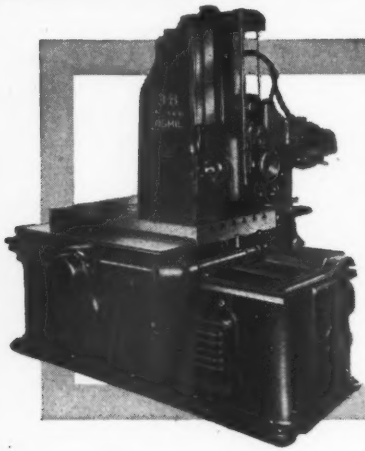

★

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling . . .

★

"TWO TO THREE TIMES the production and higher quality work" is what users are saying about the 3-B DeVlieg JIGMIL—and here are some of the reasons why the results are better: 1. Automatic positioning of spindle from one location to another in response to measuring rods and push buttons to within less than .0001 (one ten-thousandth part of an inch). 2. Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work. 3. Unique operation and controls that make possible high precision work with relatively little skill.

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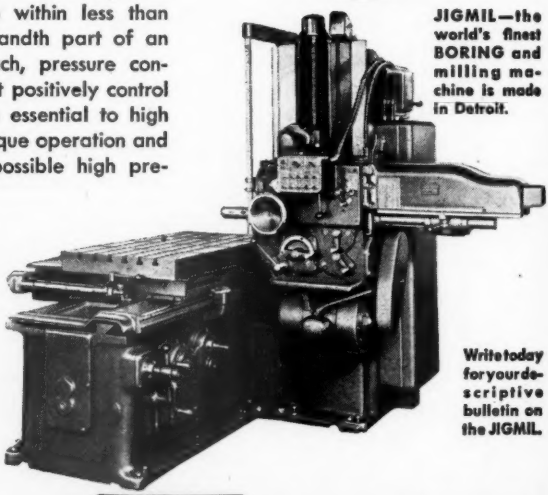
The JIGMIL does most production boring and milling work faster and more accurately with rugged tools working in the open than is possible with the part trapped inside the walls of a boring fixture.

JIGMIL YOUR WORK



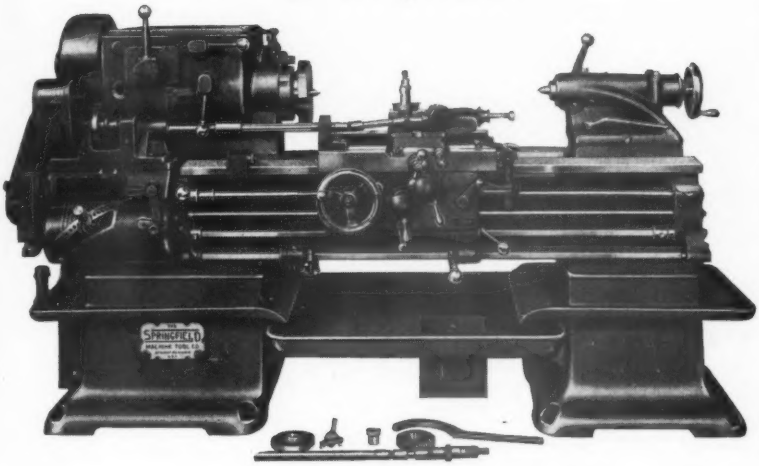
JIGMIL—the world's finest BORING and milling machine is made in Detroit.

Write today for your descriptive bulletin on the JIGMIL.

DeVLIEG MACHINE COMPANY DeVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

SPRINGFIELD PRECISION LATHE

Out in front!



● Headstock . . . twelve speeds . . . only half of the easy-shifting spur gears mesh at one time.

Motors . . . V-Belt or silent chain drive.

Bed . . . permanently true—made of high test alloy to resist warp or marring under severe service.

Apron . . . extra heavy—operates on Ball and Bronze bearings throughout.

Taper attachment . . . hair-trigger adjustment.

Compound rest . . . sturdy, firm.

Tailstock . . . all bearings and bed ways oiled from one well.

From headstock to tailstock—the SPRINGFIELD Lathe is ***out in front!***

SEND TODAY FOR BULLETIN No. 163

Tells the why and how of Springfield's accurate production.

THE SPRINGFIELD MACHINE TOOL CO.

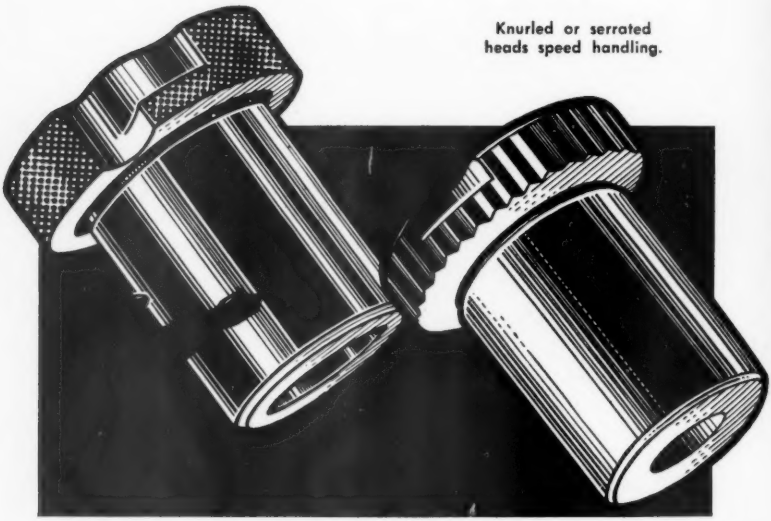
SPRINGFIELD • OHIO, U. S. A.

Universal Drill Bushings Save Drills and Tools

Back in 1919 W. R. Fisher of the Universal Engineering Co. originated the idea of standard drill bushings. Today, 26 years later, these bushings are saving countless manufacturers thousands of dollars by reducing drill-breakage and insuring more accurate drill, ream, and tap work.

Universal drill bushings are made of hardened, high quality steel with unexcelled resistance to wear through friction and galls caused by chips. Their super-finish bores, straight and round, guide tools accurately. Knurled heads speed insertion in and removal from jigs.

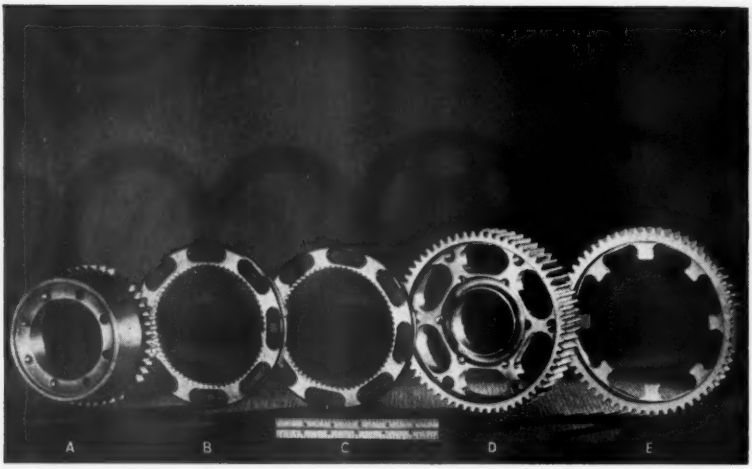
Universal drill bushings are made to the exacting standards of fine workmanship which has made the Universal Engineering Company a leader in the production of quality tools. Write today for complete information on Universal drill bushings, Mikro-lok boring bars, standard collet chucks, or any of the other superior Universal tools illustrated on these pages.



Knurled or serrated heads speed handling.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH, MICHIGAN — Fighter Plane Given by Employees — 20% Employee Bond Deductions



Gear A: Eight holes on circle ground to size and location within ± .0003".
Gears B, C, D, E: Radii at ends of elongated pockets ground to size and location within ± .0003".
Gears B, C: Radii ground to shoulder near bottom of pockets within ± .0005".

PLANETARY PRINCIPLE OF MOORE JIG GRINDER

Displaces Internal

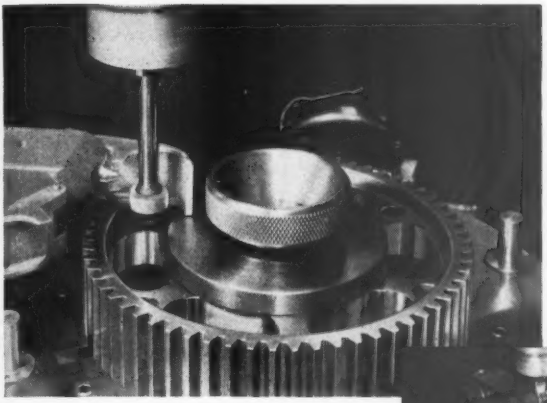
How Each of a Battery of 16 Machines Averages 4 Gears Per Hour With Complete Absence of Scrap

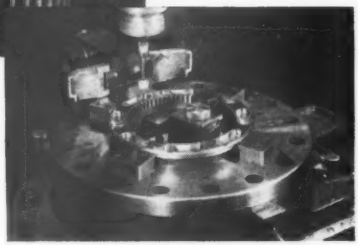
New 28-page catalog describes Moore Jig Grinder's operation and illustrates its application to dies, drill jigs, gage parts, master plates and production parts. Write for free copy.

The Moore Jig Grinder, with its unique planetary principle, grinds the holes and radii in the above gears *more efficiently* than an internal grinder *and at a reduced investment.*

Previously an entire gear was rotated in a heavy, unbalanced indexing fixture on an internal grinder's faceplate. This method proved so slow and cumbersome in the production of vitally needed aircraft engines that an automotive manufacturer finally solved the problem by replacing internal grinders with Moore Jig Grinders...with these results:

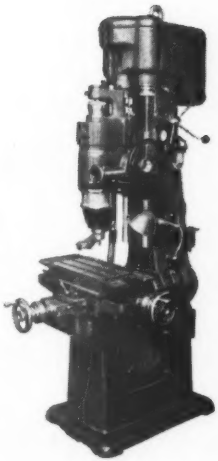
Simple stationary indexing fixtures, providing automatic hole sizing through diamond dressing, were all that was necessary to adapt this precision toolroom machine to mass-production. An average of four gears per hour are being ground on each of a





Two of the fixtures built by Moore for Jig-Grinding the radii and holes. Each fixture is equipped with an adjustable wheel-dressing diamond. A pass of the wheel over the diamond dresses it to the correct diameter, so that the radius is automatically ground to size.

Grinders IN MASS-PRODUCTION



battery of sixteen machines *to closer tolerances and with simpler set-ups ...plus the complete absence of scrap.*

Since installation, the Moore Jig Grinders' performance has so well vindicated the manufacturer's judgment that ten additional machines are being provided for the same purpose.

The only machine of its kind, the Moore Jig Grinder, finish-grinds straight or tapered holes to size and location, corrects hardening distortion and removes decarburized surfaces. It has a capacity to grind holes from .030" to 4" and grinding speeds of 14,000 and 50,000 RPM. And it provides lead screw accuracy of .0002" over 16".

MOORE SPECIAL TOOL CO., INC.
728 UNION AVE., BRIDGEPORT 7, CONN.

Complete details of this job will be sent upon request.

Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND

For Precision Grinding and Sharpening

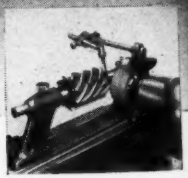
ROTOREX UNIVERSAL GRINDER

TOOL ROOM • MODEL SHOP • PRODUCTION

8" x 15" capacity. Variable spindle speeds ranging from 4500 to 6000 r.p.m., making the machine flexible and particularly suitable for delicate grinding jobs. Readily interchangeable attachments for single purpose jobs such as cylindrical, internal, and radius grinding, makes the Rotorex Grinder a universal machine for all kinds of grinding and sharpening operations.

PROMPT DELIVERY

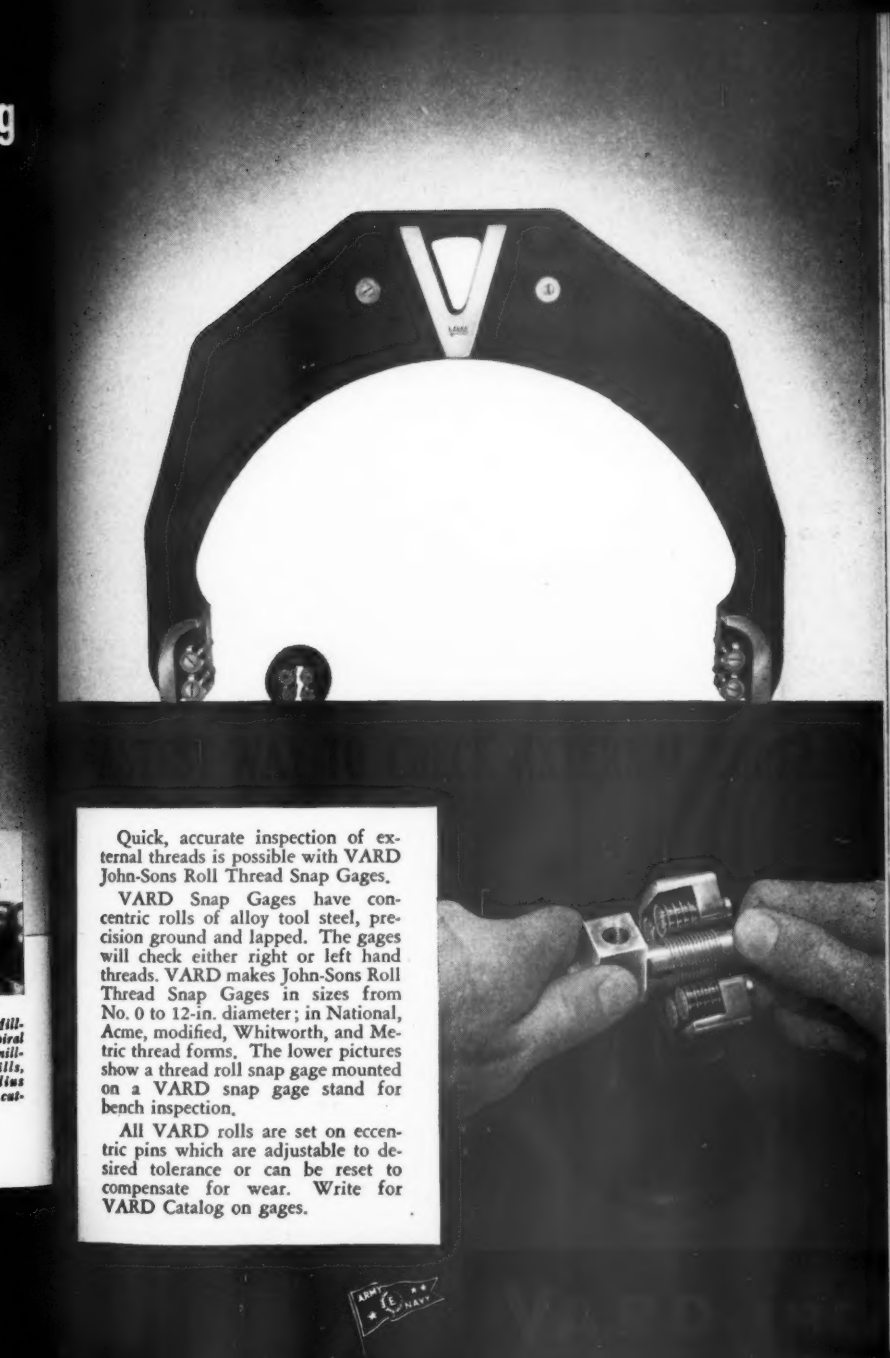
Internal Grinding Attachment — Will grind holes, straight or taper, from 3/4" upward and 2" in depth with standard quill.



A Wide Variety of Milling Cutters—With spiral teeth, side and face milling cutters, end mills, angular cutters, radius cutters, gear tooth cutters, etc.

Douglas Machinery Co., Inc.

150 BROADWAY • NEW YORK 7, N. Y.



Quick, accurate inspection of external threads is possible with VARD John-Sons Roll Thread Snap Gages.

VARD Snap Gages have concentric rolls of alloy tool steel, precision ground and lapped. The gages will check either right or left hand threads. VARD makes John-Sons Roll Thread Snap Gages in sizes from No. 0 to 12-in. diameter; in National, Acme, modified, Whitworth, and Metric thread forms. The lower pictures show a thread roll snap gage mounted on a VARD snap gage stand for bench inspection.

All VARD rolls are set on eccentric pins which are adjustable to desired tolerance or can be reset to compensate for wear. Write for VARD Catalog on gages.

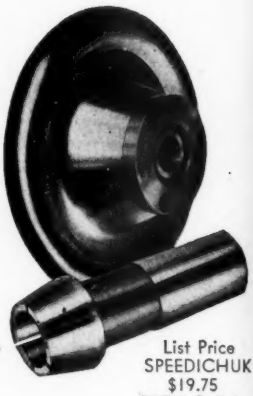
ARMY NAVY

FOR ACCURACY TO .0001"...

SpeediChuk
WITH THE Precision BREN COLLET

Increases 1/2" Collet Capacity Lathes to 3/4"

- **Fits ATLAS, LOGAN, SOUTH BEND, CLAUSING Lathes and others with a 1½" x 8 Thread Spindle Nose having a No. 3 Morse Taper on inside**



Accuracy to .0001" is possible with SPEEDICHUK because of its unique floating closing ring and the BREN Collet, whose body taper conforms with the taper of the lathe spindle.

Centering to desired accuracy may be attained by tapping work, and indicating. SPEEDICHUK is ideal for tool room use or short production runs where speed in opening and closing on work is not essential. It requires no adapter plate and is easily fitted to the lathe.

List Price
SPEEDICHUK
$19.75
BREN Collets
Round $4.50
Sq. & Hex. $7.50

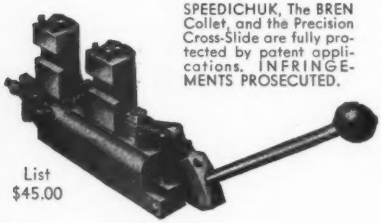
IMMEDIATE DELIVERY FROM STOCK

..AND FOR PRODUCTION CUT-OFF WORK, FORMING, ETC.

THE NEW Precision LEVER TYPE CROSS-SLIDE

- **Equipped with sensational tool leveling adjustment — Maintains tool in absolutely horizontal position.**

SPEEDICHUK, The BREN Collet, and the Precision Cross-Slide are fully protected by patent applications. INFRINGEMENTS PROSECUTED.



List
$45.00

A sturdily constructed job, this Cross-Slide has no rack and pinion to become clogged with chips. Handle adjustable in three positions for convenience of operator. Has a five inch travel.

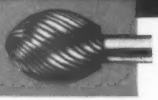
Three models fitting Atlas, Logan, 9" South Bend; can be adapted to most other bench lathes.

- Order from your dealer or write us for literature.

GENERAL DIE-STAMPING-TOOL COMPANY
Precision Collet Division, 262-272 Mott St., New York 12, N. Y.

Precision product

"CLEAN EARS" in a jiffy



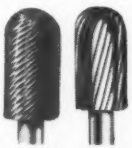
ROTARY filing solves many production problems in getting at places otherwise difficult to reach . . . as in die sinking, metal pattern making, tool making, mold, model and small-parts finishing.

In such work, rotary files are extensively used for breaking and chamfering corners, removing burs and fins, cleaning, enlarging and elongating holes and slots; also for removing scale from aluminum, brass, bronze and iron castings.

It is fitting that Nicholson's vast experience in file making should become of service to industry in connection with rotary as well as other types of files.

WRITE FOR CATALOG AND PRICE LIST. For deliveries, consult your mill-supply house.

Nicholson sells both Hand Cut and Ground *types of Rotary Files—each in 16 standard styles or shapes; in 3 cuts (Coarse, Medium and Fine); in diameters of ⅛" to 2".*



HAND CUT GROUND

NICHOLSON FILE CO., 95 ACORN ST., PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON ROTARY FILES
HAND CUT AND GROUND • FOR EVERY PURPOSE

NICHOLSON U.S.A.

There is no substitute

for 32 Years of experience as

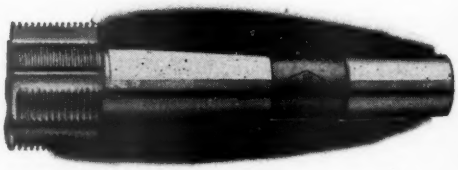
Thread Specialists

32 years of accumulated experience . . . 32 years of learning how . . . that qualifies us as THREAD SPECIALISTS.

The men who design, engineer and build Pipe Machinery threading tools and gages understand your problems, and know how to meet them.

They are thoroughly familiar with today's precision standards, and what it takes to maintain these standards on the production line.

You can put your full confidence for sustained accuracy in PM Cutting Tools and Gages. Consult your PM Handbook for standard items . . . write us about your special requirements.



ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.

Custom

TOOL & DIE BUILDERS

SATISFYING those who are satisfied only by excellence . . . producing custom-designed tools for those whose discrimination is sharpened by the demands made upon them as Industrial Leaders in these critical days . . . Star Machine & Tool Company serves now as it has for three generations in the tool-making field.

This background of craftsmanship in designing made-to-order precision tools, which are the foundation upon which our American system of mass production is built, has helped us to fulfill demands made upon us by War Production . . . and will, soon, we trust, again be turned to the forming of the tools for Peace.

Designers and Manufacturers

OF DIES • JIGS • FIXTURES • GAGES • SPECIAL MACHINERY • JIG BORING • PLANER EQUIPMENT

STAR ★
MACHINE & TOOL COMPANY

9320 Woodland Ave • Cleveland 4, Ohio

NO OTHER COLLET CHUCK

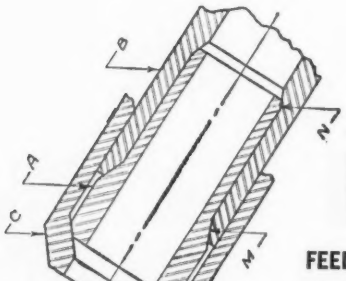
on the Market

1. Delivers accuracy of .0005"

2. Permits Collet to collapse 1/32"
(REPLACING 7 STANDARD SINGLE-PURPOSE COLLETS)

3. Grips Drills on Flutes, permits stubbing

4. Grips tool at 8 points instead of 3



HOW IT WORKS

Collet A automatically lines up concentrically with axis of Shank B by two cam surfaces of collet M and N mating with cam surfaces of shank. These cam surfaces mate to within .0001" and wear equally. Thus collet aligns with Axis of Shank, and is drawn back by Collet Cam Surface L and Nose Piece C. Collet, open-slotted at both ends, collapses equally along entire length, remains aligned, and grips "like a vise".

Get the full story at no cost on this amazing development. It may mean much to you in the immediate post-war future, as well as to-day. Erickson Collet Chucks are practical everywhere that chucks are used. Remember this, the heart of this revolutionary gripping device is the collet and that chucks can be adapted specially for any problem you may have, if standard chucks are not suitable. Write to-day.

DRILLS LAST LONGER

FEED FASTER, COST LESS TO USE

The Erickson collet and collet chuck, first revolutionary chucking development in 50 years, means tremendous economies in drilling operations. It delivers more holes per grind, permits greater feeds and speeds, allows cast-off broken drills to be used up, saves up to 50% in breakage costs and up to 50% in set-up time. It gives you superior alignment and gripping power, and delivers a greater guaranteed accuracy than any other chuck.

SEND COUPON TODAY

Dept. B of Erickson Steel Co.
2307 Hamilton Ave., Cleveland 14, O.

( ) Supply Catalog B and full information at no cost on Erickson Collet Chucks.

( ) Send Field Engineer to help solve a chucking problem. No obligation.

NAME .....

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ERICKSON *Means* PRECISION *in* COLLET CHUCKS

BAKER

Model 314 A Universal Quick Change Type Heavy Duty Drill

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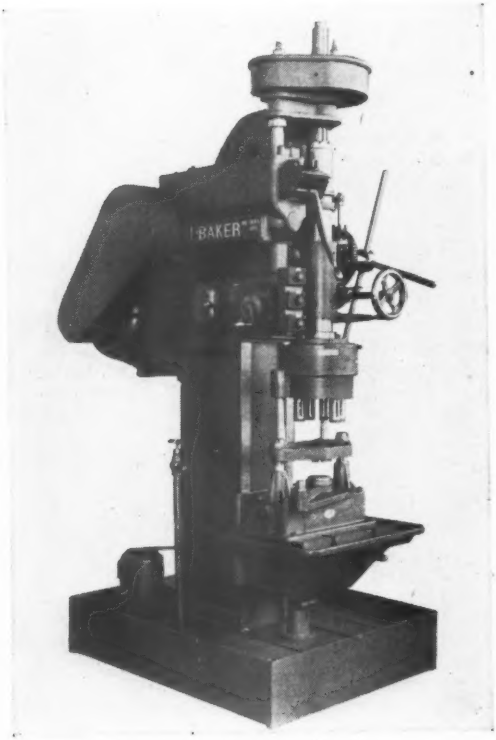

This machine has ample capacity to drive three-inch diameter high speed twist drills to the limit of their capacity, and can be adapted to parts requiring multiple operations through flanged quill spindle construction which gives better adaptation of multiple head. Six quick changes of speeds are provided, and one conveniently placed speed change control lever allows for instantaneous changing of speed. Reversing controller for tapping operations is standard equipment on this machine.

The two piece frame design allows use of spacer blocks between upper and lower frame for increasing clearance from end of spindle to top of worktable. This type of drill is offered in various sizes, all having multiple splined spindle top driving ends and multi-vee belt drive.

For complete details, send for our folder 1000 X

BAKER BROS.

TOLEDO 10, OHIO

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It will take you to a Sure Cure for Production Ills

Precision is winning the war... Let it win the peace for YOU!

A complete inspection laboratory on wheels for

ONLY

$1850.00

THE MOBILE UNIT INCLUDES:

(1) a set of 83 inspection grade gage blocks, (2) a four-range electric comparator, (3) optical flats, (4) Monolite, (5) master flat, (6) master square, (7) parallels, (8) pointed accessories, (9) gage block holders to make gage combinations, (10) precision surface plate, (11) a complete set of instructions on the use of every instrument, (12) set of 3 straight edges, each with 4 blades, (13) 5-inch sine bar, (14) magnifying light, and (15) a vernier gage block.

Write for new Quality Control Book

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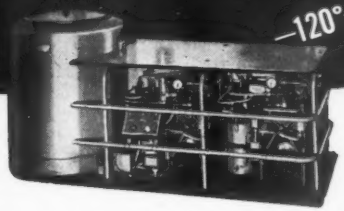
CONTINENTAL MACHINES, INC.
1303 S. Washington Ave. • Minneapolis 4, Minn.

Increase Hardness and Toughness of Steels



CASE REPORT No. 1
PART—Ball Bearing Race.
MATERIAL — S.A.E. 52100 Chrome Steel.
RESULTS — After hardening and drawing, this race is Cold Treated at —120° F. Rockwell C scale hardness of 67½ to 68 results.

CASE REPORT No. 2
PART—Gear for Naval Component.
MATERIAL—S.A.E. 2512 Carburizing Steel.
RESULTS—After sub-zero treatment, a hardness of 64 Rockwell C scale was obtained on this part; best previous values ranged from 56 to 57.

CASE REPORT No. 3
PART—Machine Tool Overarm.
MATERIAL—S.A.E. 4615 Molybdenum Steel.
RESULTS—Heat treating produced only 57-60 Rockwell C scale hardness. Sub-zero treatment increased hardness to 60-62 Rockwell.

CASE REPORT No. 4
PART—Punch Die.
MATERIAL—Atha Pneumatic Steel.
RESULTS—After heat treating the highest reading on this part was 58-59 Rockwell C scale. Cold treating increased it to 61-62.

These actual case reports from the field are typical of many remarkable increases in steel hardness obtained by using Deepfreeze sub-zero chilling to supplement normal heat treating procedures.

Why Cold Treating Makes Steel Harder

Metallurgists have found that steels rarely reach full hardness until a complete transformation of Austenite into Martensite is accomplished. In ordinary heat treating, this transformation is still incomplete when the steel has been cooled to room temperature.

By Cold Treating at —120° F. in a Deepfreeze machine, practically all Austenite remaining after quenching to room temperature is transformed into Martensite with a resulting increase in hardness.

Learn How Cold Treating Can Help You

To determine the exact benefits you can derive from applying Cold Treating to your hardening problem, consult the Deepfreeze Engineering Service. Their wide field experience and metallurgical facilities are at your disposal. Your inquiry entails no obligation whatever.

FREE COLD TREATING DATA BOOK For the complete and latest data on the use of Cold Treatment for metals in industry today, get the Deepfreeze Metal Chilling Data Book. In this handy working guide on the use of industry's newest production tool you can learn how to use sub-zero temperatures for the shrinking, testing, hardening and stabilization of metals in your plant. A free copy can be obtained by writing Deepfreeze, North Chicago, Ill. Write today for as many copies as you need.

LET THEM HELP YOU

TOOL & DIE JOURNAL

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● **The following informative articles, in attractive pamphlet form, are all valuable for men engaged in tooling and production shop practices. Let them help you with your problem.**

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CONTOUR MACHINING TECHNIQUE—Most of the many illustrations used give details on correct saw tracking, technique for cutting various angles, operating speeds, internal sawing procedure.

FACTS ABOUT CHROMIUM FOR THE TOOLMAKER—Written specifically for tool and die men . . . covers hardness and thickness of plating and action of chromium on machining and stamping tools.

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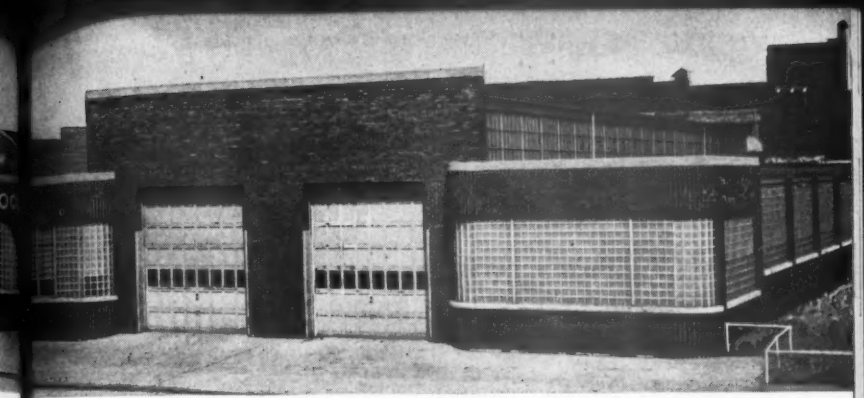

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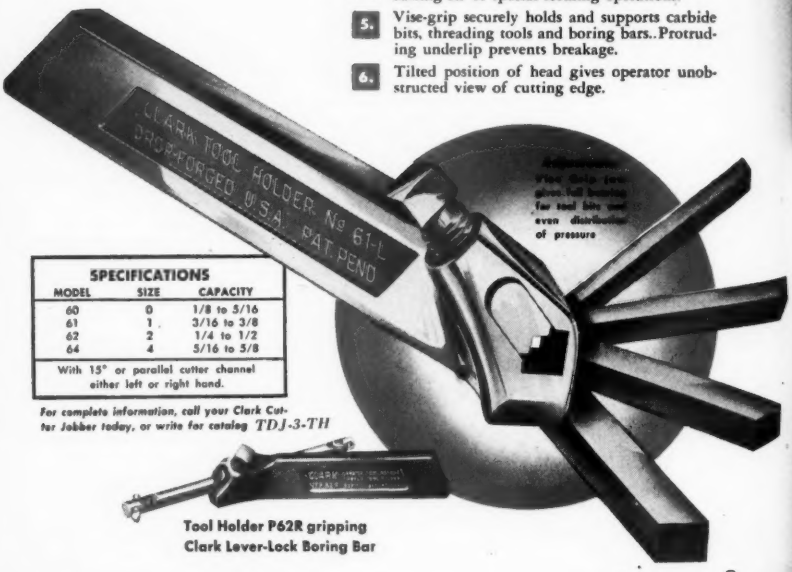

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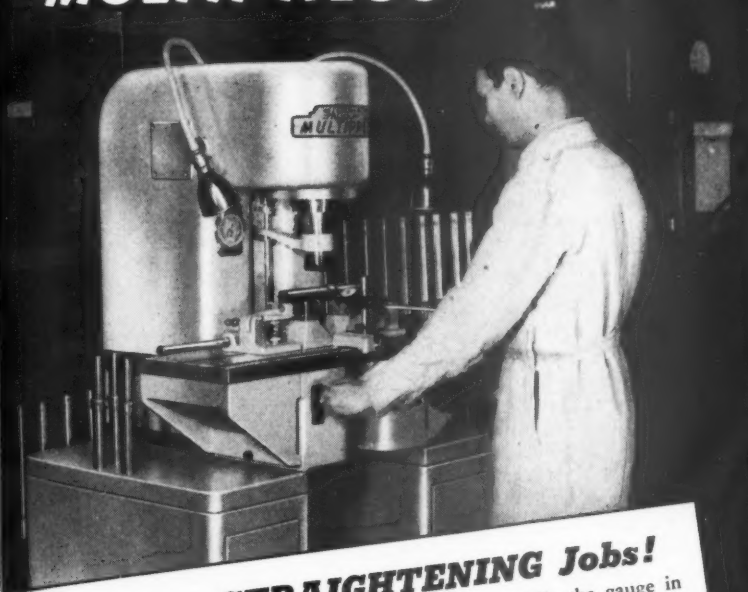

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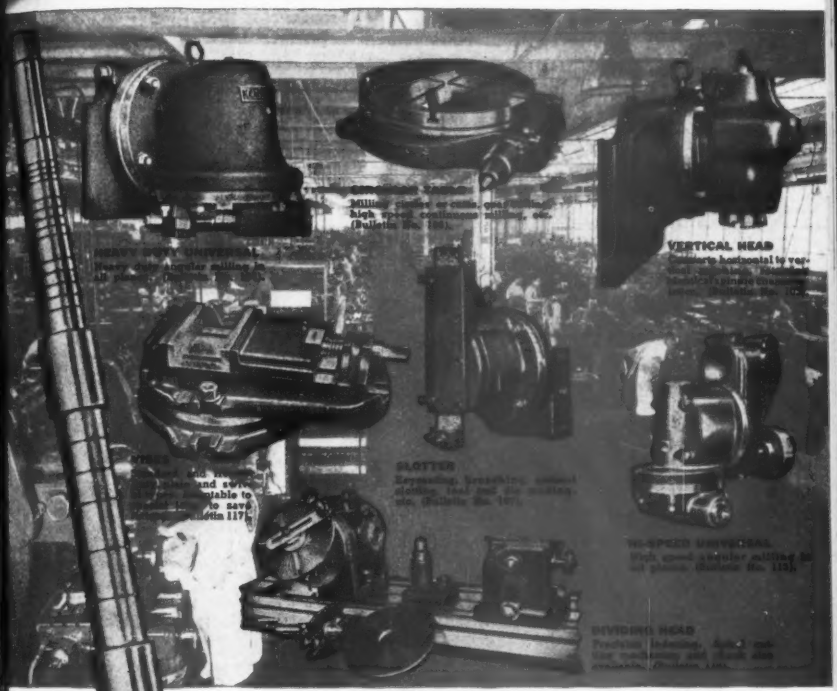

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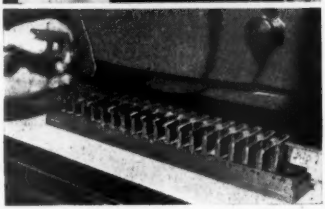

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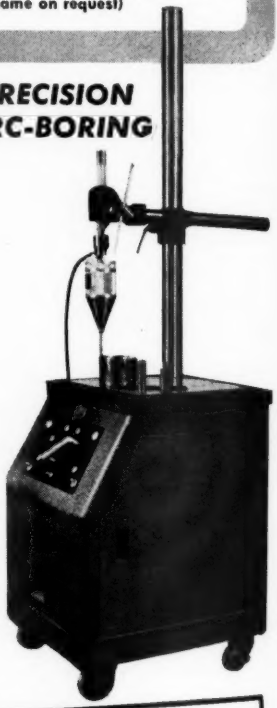

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INDUSTRY LOOKS INTO THE FUTURE

A FEW weeks ago Dr. William J. Hale delivered an address to a large group of Cleveland business men. Dr. Hale is a noted chemical engineer and research consultant on the staff of The Dow Chemical Company. It is logical, therefore, that his discussion would relate to the chemical field and be influenced by the industrial activities of the Dow organization.

Dr. Hale's discussion was not only provocative in its comparisons, but startling in its predictions. The address in its entirety encompasses a much broader plane than we can cover; therefore, we have selected for comment portions which we believe every alert industrialist and his staff will want to mentally file for future reference and consideration.

Dr. Hale believes that the Chemical Age is now supplanting the Machine Age, and that it has come to reverse the "unequal distribution of supposedly valuable raw materials for industry" and to "direct mankind to greater and greater utilization of renewal resources obtainable from the atmosphere". This means that "plant growth" and "chemurgic outpourings" are to provide more generally the raw materials of the future. Chemurgy is the branch of applied chemistry devoted to industrial utilization of organic raw materials, especially farm products of which soy bean oil for paints, varnishes and plastics and Georgia pine for paper pulp are everyday examples.

He says: "The plant world is finally decomposing itself back into carbon dioxide and water wherewithal the atmosphere again becomes the supplier of these same raw materials for new plant growth. But in the midst of this decomposition the entire process may be checked at the halfway point, or that of *ethyl alcohol*, if proper enclosure of material is instituted and proper foods are supplied to enzymes (def.—digestive accelerators—ferments) present". From this natural process we derive constituents for the compounding of plastics and when the decomposition is interrupted, ethyl alcohol is obtainable. "There are clearly discernible the bases of two mighty industries—*plastics* and *alcohols*. With never a dearth in this surfeit of raw material so long as the sun shineth and the moist air bloweth how marvellous to contemplate the magnitude of these two industries!" The quoted words are always Dr. Hale's.

Next we consider evidence that the "vast oceans that bathe the shores of all continents" constitute a "storehouse beyond our fondest desires". Specifically, among the metals which the oceans yield are sodium, magnesium, calcium, potassium, aluminum, iron, manganese and copper, silver. Relatively, there is a preponderance of sodium, with magnesium second in quantity. Aluminum is rated as "the 3rd most abundant el-

ement in the earth's crust" because a new pilot plant in Alabama indicates the likelihood of obtaining aluminum from ordinary clays. Dr. Hale's point now is that these data point "to *light metals* as the third great industry in our world of tomorrow".

Here we have the prediction that three comparatively young industries—alcohol, plastics and light metals—will become dominant in that order in the next twenty-five years approximately, and for 1000 years, the prediction continues, they will become increasingly dominant because "nature is constantly at work supplying men with three great classes of organic raw materials".

"In the opinion of a growing number" of chemists "there is no better fuel for internal combustion motors than alcohol and water. Its octane rating is far above 100. It burns without knock. Much of the superiority of alcohol stems from its lower temperature of burning . . . In this alcohol-water blend, of 50% each, we behold the outstanding Signal of our Times."

Reports from the South Pacific war zone describe how our airplane pilots have been able to extend the speed of their planes by injection of a small quantity of this 50-50 alcohol-water blend into the carburetor.

Dr. Hale believes that in "the course of the next quarter of a century we should be producing in this country upwards of 30,000,000,000 gallons of alcohol annually". At 20¢ per gallon this would truly be a great industry with annual sales of $6,000,000,000.

It isn't difficult to mentally project into such a picture the tremendous new plant facilities which would be required as this industry develops. But prior to the manufacture of equipment and building of plants, think what it would mean to the farmer. "On the basis of corn alone there would be required 10,500,000,000 bushels with a yield of 2.85 gallons, per bushel, as now definitely securable at the great Omaha plant." This is three times greater than the 1944 corn crop! Dr. Hale estimates that "we shall require the services in plant and on farm of an additional five million men distributed over all of the forty-eight states". He asks: "How can any normal man fail to recognize man's mightiest of industries embracing as it does the whole gamut of alcohols in general!"

The tremendous increase in farm output from which such production of alcohol could result would require more equipment—tractors, plows, harrows, disks, harvesting machinery and transportation vehicles—than farms have ever bought. The farm then would become a really mechanized activity, with Industry and its workers sharing in the development.

But a change from gasoline to alcohol would bring other adjustments and developments. Engines and their accessories could be designed for greater efficiency and longer service. The lighter metals would enter into these changes but so would the new steels. However, more of this and other metal applications later.

Dr. Hale's predictions about plastics are equally startling. The manufacture of plastics parts and products, it is estimated reliably, has increased since 1932 about 1800% to a present annual volume of about 500,000,000 lbs. He predicts that this, the second of his industries which will achieve true greatness within the next quarter century, "should be producing annually more than 20,000,000,000 lbs. . . . which, at 20¢ per pound" reaches another impressive industrial figure of $4,000,000,000.

To this point we have made no comparison between these newer industries and the older ones, and their respective potentialities. The plastics industry is a great industry today. It is a matter of record that when we first moved into war production it was necessary for the plastics industry to present proof to the military authorities as well as to other industries that plastics parts and products could satisfactorily conform

with military requirements. George Scribner, President of the Boonton Molding Company and currently President of the Society of the Plastics Industry, phrased it in his annual report: "The Plastics Industry had a hard time getting into this war, but now that it is in, it is in so deep that it will have an even harder time getting out. That is something about which we should boast, not worry. . . . Now that the war is approaching its final stages, we find that the demand for our products is so widespread that, no matter what is being cut off, they find new uses for us."

These new uses—will they be substitutes or are they truly new products? Our answer is: both. We have before us the manuscript of an interesting address recently delivered by Walter S. Tower, President of the American Iron and Steel Institute. We quote Mr. Tower: "Much has recently been said or written concerning the competition from plastics which steel will face in the postwar world. On the other hand, little has been written on the role which plastics may play in expanding the use of steel—yet that is a development which is already under way. For four years, plastics that resist heat and corrosion have been successfully and economically used as a coating and lining for steel pipe and tubes. These steel and plastic combinations are already rendering excellent service as boiler tubes and in vital parts of machinery for the manufacture of pulp and paper, essential oils, rayon and a number of other products.

"As plastics are improved and more useful types are developed, they will, of course, find wider applications. No doubt, some of them will replace steel products for certain types of service. It has been predicted, however, that plastics will help to sell more steel products than they will replace.

"It is estimated that the wartime quadrupling of capacity of the plastics industry has brought this country's total capacity up to about one per cent of the production of the steel industry. Yet if only ten per cent of the steel pipe produced today were lined with the appropriate types of plastics for the various service conditions encountered, certain phases of the plastics industry would again have to expand capacity several-fold."

The steel industry has been actively engaged in improving its products. Aircraft engines, as an example, "call for steels to resist higher temperatures and pressures than have ever before been needed in such applications . . . they provide opportunities to cut down the weights of the parts for which they are specified. . . . Looking ahead a few years, the commercial use of steel parts at hitherto unattainable pressures and temperatures should permit further improvements of engines and constructional materials for automobiles, trains, aircraft and ships."

Mr. Tower also can make startling comments: "Probably the most spectacular new product which these men (steel development engineers) consider possible is stainless steel hosiery. They point out that already some steel companies are producing stainless steel wire in diameter comparable to that of the threads used in silk or nylon hosiery. You already have heard of suits made from milk and ties from glass fiber. Why not, they say, hosiery from steel? If that particular speculation should ever become a reality, you may wonder whether the ladies will become as expert at repairs with the welding torch as they are with thread and needle."

Seriously again, we recall that "only thirty-three years ago, not a very long time back, there was no cutlery steel that would not rust—none of the stainless steel surgical instruments that now are saving lives in our field and base hospitals.

"There were no all-steel automobile bodies until about ten years ago

when steel companies put on the market the sheet steel products that made all-steel bodies practicable.

"Steel has made great strides in recent years, both as an industry and as a material. The urgency of war has accelerated that progress."

Now we come to the third of Dr. Hale's three great industries of the future: light metals. Aluminum has already reached a tonnage output of 2,000,000,000 lbs. and magnesium, before curtailment, had a plant capacity of 600,000,000 lbs. and that was almost actually attained. In twenty-five years, Dr. Hale says, 10,000,000,000 lbs. of aluminum and 10,000,000,000 lbs. of magnesium will be produced annually which, at an average ingot price of 20¢ per lb. totals $4,000,000,000.

We return to Dr. Hale's text: "We have seen wherein the plastics and light metal industries interlock by interlamination. But the interlocking of the alcohol and light metal industries brings into service the most startling of possibilities—particularly that of speedy transportation. Recent indications of this trend are to be seen in the jet propulsion rockets of Germany known as V_1 and V_2. When the fuel, alcohol, is burnt with air, as in V_1, and, at higher altitudes, with accompanying liquid oxygen, as in V_2, the products of combustion are discharged through a jet in the rear thus driving the rockets forward at terrific speed.

"Wherever new power devices are concerned that lightest of structural metals, magnesium, immediately comes to the fore. Even today magnesium has found almost universal use in construction of airplane landing wheels. Tomorrow it should find extensive use in the wheels of automobile and truck. Day after tomorrow, if not sooner, it will make up the greater part of the entire airplane. And on the third day, figuratively speaking, we may well marvel at the remarkable attainment of transcontinental speedy trains.

"On present basis, an ordinary railway car requires a weight of 3,000 pounds in construction material for each passenger hauled. With light metal construction scarcely 250 pounds of weight are required per passenger. When jet propulsion or the gas turbine system is installed we shall discover that light metal monorail trains will hurtle through space at awe-inspiring speed. A transcontinental line constructed on right-of-ways of Santa Fe and New York Central railways would cost approximately $800,000,000 and bring Los Angeles and New York City within 10 hours of each other!"

Perhaps at first reading you may think of these predictions as fantastic and related closely to day-dreaming. But let's not judge hastily. This is the day when imagination has become the sidekick of design and engineering. With it our war developments and products have made possible exploits which rival the fictional feats of Flash Gordon and his rocket ship or those of the Men from Mars.

If war with its record of destruction and suffering can provide such an incentive to inventiveness and technical ingenuity, to what heights of industrial development we should be able to rise when we contemplate the benefits and the blessings of peace!

Geo. J. Huebner

Editor

SUB-ZERO TREATMENT OF STEELS

by H. C. Amtsberg
FEEDER ENGINEERING
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Penna.

Large numbers of reports and several articles have been written on the improved properties and performance brought about by sub-zero cooling of steel part . particularly tools. Claims of several hundred per cent improvement in life, while probably exaggerated, are not uncommon. In other cases, the treatment was a partial cure for improper initial heat treatment. Nevertheless, the value of the process is unquestioned. It is likely to become a routine part of normal heat treating practices and sufficient authoritative information is already in evidence to warrant a vigorous program of actual exploitation in the shop and further study in the laboratory. It appears, therefore, that a presentation of the fundamentals of cooling hardened steels to temperatures considerably below room temperature properly correlated with the basic treatment cycle and related structual changes, is in order.

When steel is heated to its hardening temperature, the structure consists of a solid solution of carbon in iron, known as austenite, with or without alloying elements in solution, and with or without free iron or alloy carbides, depending on the composition and temperature. Austenite is relatively soft, tough, and ductile, even at room temperature. The carbides are very hard compounds of carbon and iron or alloying elements such as chromium, tungsten, molybdenum, and vanadium. When hardening such steel by cooling in some suitable medium, the austenite transforms to martensite, a hard and strong constituent that is an aggregate of finely dispersed carbides in iron. This aggregate bears one similarity to suspensions such as colloidal graphite in water except that the particle size in the former is much finer.

As explained in greater detail later, an ideal hardening operation would be one in which all of the austenite was transformed to martensite upon reaching room temperature. This is true even if the final hardness desired is much lower than would result from this ideal hardening, for it is well known that the best physical properties are obtained by quenching (i.e. water, oil, or air) to maximum hardness, then tempering to the desired combination of hardness and strength versus ductility and toughness.

In many steels, however, the transformation of the soft high-temperature constituent austenite to the hard constituent martensite does not always go to completion. In other words, after the steel has been cooled to room temperature some austenite has still been retained. This is illustrated in Figure 1 showing isothermal time temperature transformation curves of a high speed steel determined by Gordon, Cohen, and Rose (1)[1] and an air hardening die steel by Payson and Klein (2) on which cooling curves for standard treatments have been superimposed.[2] In Figure 1 (a), it is seen that oil quenching 18-4-1 high speed steel to room temperature transforms only about 75 percent of the structure to martensite while 25 percent remains as untransformed austenite. Figure 1 (b) shows that about five percent of austenite remains in the chromium air-hardening steel after cooling in air to room temperature. Many other steels retain austenite in a similar manner provided the cooling is sufficiently rapid to prevent transformation at a

[1]The figures appearing in parentheses refer to the bibliography appended to this discussion.

[2]For a fundamental discussion on isothermal transformation curves, the reader is referred to work of Davenport (3) and Greninger and Troiano (4).

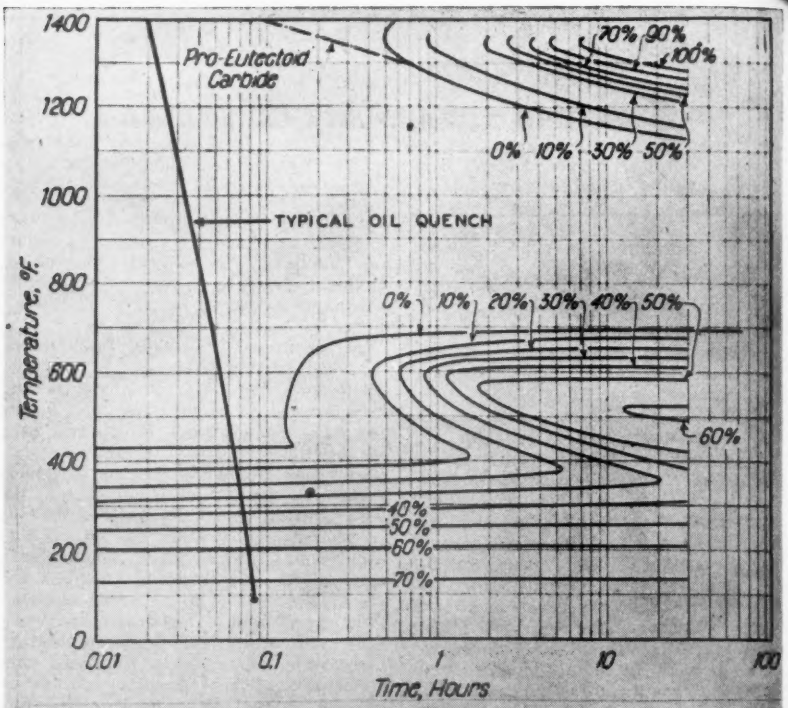

FIG 1a. TIME-TEMPERATURE TRANSFORMATION CURVE FOR 18-4-1 HIGH SPEED STEEL

high temperature to a relatively soft product—pearlite. The cooling rates of the steels in Figure 1 could be reversed and the amount of austenite retained in each case would be approximately the same. Furthermore, K. Honda and K. Iwase (5) have shown that more austenite *may* be retained by oil quenching than by water quenching, probably due to the greater degree of thermal stress in the latter. It is further believed that the same phenomenon exists in higher alloy steels when air and oil quenched, respectively. It is impossible to state a specific rule, but it may be *generally* said, that the higher the carbon and alloy content and the higher the hardening temperature, the greater will be the tendency to retain austenite. Thus, it is apparent that mixed structures of this nature may be present frequently in "as quenched" steel.

Retained austenite can be made to transform in a number of ways. In a few steels, in which the amounts of retained austenite are relatively small, a sufficient length of time (sometimes months or years) at room temperature will change all or nearly all of it to martensite. This, of course, is frequently disadvantageous particularly for dies and gages because full hardness and dimensional stability are not obtained at once. This explains the inability of many gages to maintain shape and size accurately over a long period of time. In all steels, the austenite can be transformed by tempering, but frequently such high temperatures are required as to lose hardness of the martensite and cause transformation of the austenite to a softer product—bainite. By again

referring to Figure 1, it is obvious that this purpose may be accomplished by simply continuing cooling of the steel to considerably below room temperature. Gordon and Cohen (6) have shown how such treatment reduces the stability of the retained austenite, that is, reduces its reluctance to transform. In many plain carbon and low alloy steels, either medium or high carbon (including carburized), one such cooling to a temperature of 100°F is sufficient to virtually complete all transformation. In other steels, particularly the highly alloyed die steels, several such operations may be necessary with intermediate tempering between each sub-zero treatment. Indeed, high speed steel must be tempered in the conventional manner at least once during the heat treatment cycle in order to obtain transformation of all of the austenite.

Now that it has been determined how an austenite-free structure may be obtained, is it worthwhile to go to all this trouble? It is well-known that, from the mechanical property standpoint, the amounts of retained austenite and untempered martensite should be at an absolute minimum in the final product. Repeated tests by Cohen and his coworkers (6, 7) have indicated higher strength and toughness without appreciable loss in hardness when all the austenite has been transformed by tempering or sub-zero treatment, especially the latter, and this is particularly so when the completely transformed structure is followed by a final temper for stress-relief. H. Scott and T. H. Gray[3] have shown (see Figure 2) a more than two hundred percent increase in transverse bend strength over a considerable range in hardness by a cyclic treatment after hardening. This consisted of alternately tempering in boiling water and cooling to 100°F three times followed by the

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[3]Metallurgical Section Engineer and Consulting Metallurgical Staff respectively, Westinghouse Research Laboratories.

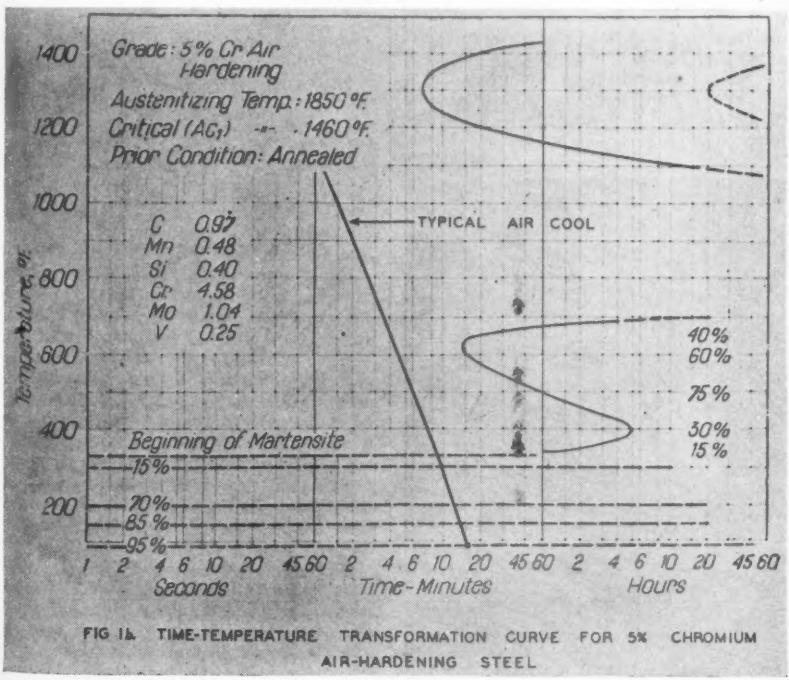
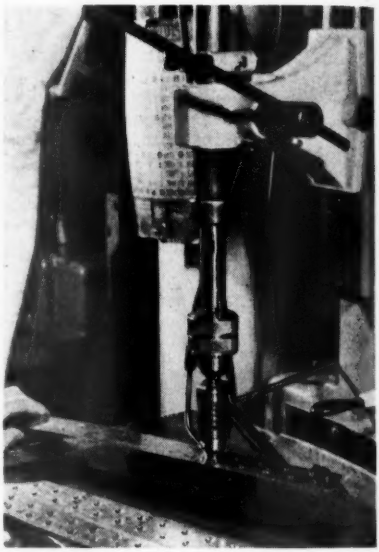


FIG 1b. TIME-TEMPERATURE TRANSFORMATION CURVE FOR 5% CHROMIUM AIR-HARDENING STEEL

Glenn L. Martin Company Engineering Developments Of Industry-Wide Interest

A new tool for dimpling hard and brittle sheet metals such as Reynolds 301-T, Alcoa 75-ST and the new lightweight magnesium alloys, thus extending their range of usefulness to the aircraft industry, has been announced by The Glenn L. Martin Company, Baltimore, Maryland, and will be soon made generally available through licensed tool manufacturers.

Spin Dimpler for Brittle Metals



Known as the Martin Spin Dimpler, and developed by Hermann E. Veit of Martin Engineering whose pressure pad dimpling tool for 24-ST and softer alloys is widely used throughout the industry, the new tool is used in a standard drill press and forms the dimple by spinning the metal rather than by pressing it into shape. In experimental use at The Glenn L. Martin plants, perfect dimples have been formed in both 75-ST and R-301-T in from 2 to 5 seconds per dimple and in cold AMC-52-SH in from 5 to 9 seconds per dimple. The same tool was used for both aluminum and magnesium alloys, but a lubricant was used with the former and omitted with the latter.

The actual spin dimpler consists mainly of four parts—a female die, similar to that used with a pressure pad dimpler, into which the metal is spun, a male spinning tool, a trimmer cutting edge to remove any metal which is extruded upward during the forming of the dimple, and a pressure pad assembly for holding the sheet in place during dimpling. The spinning tool, itself, has several projections which are rounded off to eliminate machining of the metal from the inside of the dimple. To permit easy replacement, it screws into the pressure pad assembly shaft.

In operation, the spin dimpler has

been used on a single spindle Allen drill press, but is equally adaptable to any drill press capable of operating at 1500 RPM and presents no undue problems for the unskilled or semi-skilled worker. Exact centering of the dimple is assured by a pilot on the spinning tool which conforms to the ID of the rivet hole.

Dimples formed by the spin dimpler feature a sharp edge similar to a machined countersink, leaving no void around the rivet head as in the case of the ordinary pressed dimple. Despite the fact that the cladding of the sheet is partially removed by the trimming edge, comprehensive laboratory tests have demonstrated that the spun dimple resists corrosion as well as a machine countersunk hole.

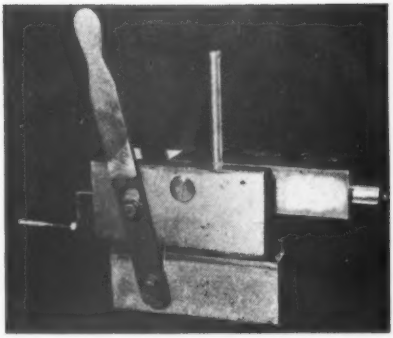
The spin dimpler has ben used at The Glenn L. Martin Company to form 100° dimples for $\frac{3}{32}$", $\frac{1}{8}$", $\frac{5}{32}$" and $\frac{3}{16}$" diameter rivets in both aluminum and magnesium alloys varying from .020" to .064" in thickness. In the case of aluminum "Tycol-655" was used as a lubricant.

Arbor Fixture Feeds Bushings to Centerless Grinders

Bushings are now being ground on centerless grinders, thanks to a new attachment designed by E. W. Buebel, a Glenn L. Martin Company tool room employee, which makes it possible to hold tolerances within the necessary close limits.

The new device comprises a tilting and sliding block carrying an arbor and is attached to the side of the grinder by means of a bracket which supports the block by means of a dovetail slide.

The hole in the bushing is finished to size in the conventional manner and the bushing is then loaded on the arbor. The arbor block is then fed toward the wheels until the bushing engages the wheels of the grinder for about $\frac{1}{2}$ of an inch. The feed wheel then draws the bushing along the arbor during the grinding operation. The external periphery of the bushing has to be ground true because the arbor is approximately 1½ times the length of the bushing and the bushing is ground for its entire length before leaving the arbor. The only possibility for error in concentricity in this arrangement is in the tolerance of the sliding fit between bushings and arbor.



The new fixture has made it possible to use centerless grinders for bushing grinding jobs that previously required the placing of each bushing on an arbor and the centering of the arbor for each individual job.

Staking Dies for Securing Bearings

To facilitate replacement in service and to improve production methods, bearings will be staked, instead of spun, into aircraft parts at The Glenn L. Martin Company, except for assemblies in magnesium alloy housings.

The staking is performed by placing the part containing the bearing between upper and lower dies in a punch press. The dies are constructed with projecting staking bits which force the housing material over the edge of the bearing in six places around its perimeter, thereby anchoring the bearing firmly within its housing. Both sides of the housing are staked simultaneously by a single stroke of the press.

In the swaging method formerly used, it was necessary to hold the part in a fixture on a drill press and spin the metal over the bearing.

Greatest advantages of the new method are ease of service repair and saving of

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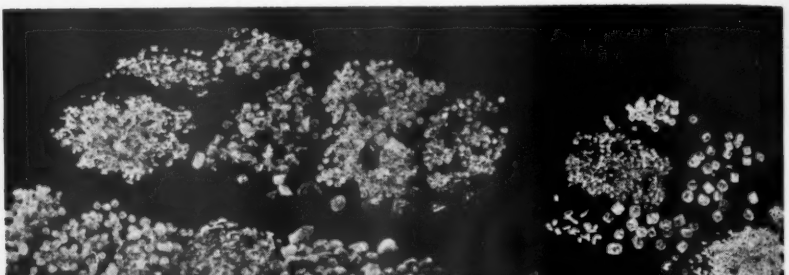


The Proper Care And Selection Of Industrial Diamonds

by Sheldon M. Booth
PRESIDENT
Diamond Tool Company
Chicago, Illinois

Industrial diamonds, particularly those used for the dressing of grinding wheels, are generally recognized as vitally important to the maintenance of our war effort. Recent emphasis on the necessity for conservation of the available supply of industrial diamonds has focused attention on the importance of careful selective buying of these diamonds for specific uses. Equally important is the type of setting in which the diamond is mounted and the nature of the tool in which it is to be used. Likewise there is today greatly increased interest in determining the best methods of wheel dressing with diamond tools in order to prolong the life of the diamond.

Industrial diamonds are customarily available in three quality grades: Common, Medium and Select. Medium and Select stones are less plentiful than the Common quality and are proportionately two to four times more expensive. It is in these higher grades which are sometimes essential for specific purposes that the greatest shortage exists.

The Basis of Grading

Common quality: One big diamond, rough, all diamond, no special shape or special density guaranteed.

Medium quality: Diamonds which possess either special shapes for special purposes, or special grain density without the special shape, not both.

Select quality: Stones which are of special density and of special select shapes (both).

Specifying Diamonds

In purchasing industrial diamonds it should be borne in mind that it is the crystal which cuts rather than the contour of the stones. Many buyers specify Medium and Select quality stones in the

belief that they are securing a diamond with much longer life; that they can use a smaller size, and, consequently, that they are getting more value for their money. Actually the reverse is true. It is sounder economy in most instances to use Common quality diamonds which, if bought in sizes in proportion to the grinding wheels to be dressed, will do fully as good and often a better job, and will last longer if they are wisely used and re-set at frequent intervals. This matter of frequent re-setting is extremely important for it will do more than anything else to prolong life of the diamond.

Such a buying policy is recommended as tending to insure prudent utilization of the available supply of Common quality diamonds and thus definitely conserving the diminishing supply of the scarcer, more expensive grades.

An outstanding consideration in purchasing diamonds of a lower rather than a higher grade for straight dressing purposes is that the lower grade diamonds must be of a larger size because their crystals are not as closely knit. This still leaves, however, a considerable price advantage when compared to the Medium and Select grades, even in the smaller sizes of the latter.

Diamond Hardness vs. Wheel Hardness

The fullest possible utilization of each Common quality diamond requires that a number of factors be considered. There must be a balanced relationship between hardness of the wheel and hardness of the diamond. Too hard a wheel will destroy the diamond; too soft a wheel has a tendency to make it round. In many cases, economical procedure will dictate the use of slightly harder grinding wheels.

Pointed Diamonds vs. Proper Dressing

An insistence by buyers on prominently pointed diamonds has made heavy inroads on the higher grades, whereas in actual use the sharp points eventually become rounded off unless the best dressing procedure is followed. In most cases the same advantages can be obtained from Common quality stones by applying the diamond to the wheel at a 12 degree "down angle" and by rotating the nib at intervals. In this way the diamond sharpens itself while being used; there is a smaller area of contact between the wheel and the diamond, hence its cutting efficiency is maintained and wear on the diamond is reduced. Life of the diamond can subsequently be multiplied many times by re-setting at proper intervals, usually every two or three months.

Grain Structure Position

A diamond can be mounted according to two positions of grain structure, correct or incorrect. These positions have distinctly different effects on the cutting power of the diamond. For example, if the stub ends of the crystals are applied to the wheel in not too large a contacting area, the diamond will overcome the wheel resistance and the ends of the crystals will shave the wheel. This constitutes a successful dressing operation. On the other hand, if the grain structure is not correctly placed in the mount, it will not cut even though it may be a good diamond and have great cutting power. It is readily seen, therefore, that experience and specialized skill are required in diamond setting and re-setting. A new diamond which will not cut properly when received is not necessarily defective but should be immediately returned for re-setting.

Method of Setting

Because of this advocacy of a wider use of Common quality diamonds and their more frequent re-setting for longer life, the method of setting is important. It should be "tender to the diamond". Under one system there is no extreme hydraulic pressure applied during the setting process. A hand die-casting process is used which tends to put a gentle 15 to 20 pounds pressure on the metal in order to hold the diamond into the setting during the cooling process. This method provides an absolutely firm setting for the diamond and avoids the danger of developing or increasing any fracture tendency in the diamond. In other words, it holds the diamond together with a non-crushing but gentle pressure.

In this patented process a silver alloy of 1400°F melting point is used in which the diamond is inserted and held. A tight bond between the diamond and this holding metal is secured by impressing a die with a correct size hole upon the surplus metal raised above the diamond during

the setting process. Thus while in a state of putty-like consistency, the metal inside the steel shell, while having the diamond centered therein, is pressed down into "lock keys" and is held during the cooling or "freezing" process for a matter of a minute or two.

These lock keys or ears are a part of the setting shell and serve to dissipate the heat generated by and within the diamond. The heat travels from the diamond rapidly into the outside steel shell, thus protecting the low melting point metal in which the diamond is molded and held inside the steel shell. A higher melting point metal could be used to hold the diamond, but that would create an added inconvenience in the re-setting process.

Re-setting Economies

The diamond is unlocked from its setting for re-positioning by application of a 1400°F flame, which does not melt the steel jacket but does enable the operator to re-position the stone and repeat the die-casting operation. This restores the diamond to a new life of service less only the amount previously worn off. All chipping, breaking by sawing, hammering, cutting or application of extreme heat, that cause serious damage in attempting to remove diamonds from so-called "permanent" settings, are avoided by this method. The lock keys dissipate the dressing heat and enable the low temperature holding metal to withstand the shock and stress of any proper dressing operation.

Diamond Costs vs. Wheel Costs

Some companies doing precision grinding attempt to cut the cost of their grinding by using the hardest wheels obtainable. These wheels may last longer but the users fail to realize that their diamond cost in most instances is doubled by the use of the extremely hard wheels, thus defeating economy.

Increasing familiarity with the advantages of resettable Common quality diamonds through proper use and frequent re-setting to compensate for wear should demonstrate that they provide the most economical, practical, general run type of dressing tool obtainable. Widespread practice of these economies will result in conserving the national supply of industrial diamonds and be a very real contribution to our war effort.

(CONTINUED FROM PAGE 105)

material. There was no assurance with the spinning method that a damaged or worn bearing, after removal from the housing, could be satisfactorily replaced. The spun-over metal serving as a retainer ring frequently sheared off, thereby preventing a second swaging operation. When this occurred, the part was necessarily scrapped.

Service men now can replace the bearing by merely staking the material at different points. One original and two replacement stakings are possible, since the total length of six stake indentations occupies but one third of the distance around the bearing.

In magnesium alloys, due to low ductility, the pressure necessary to form the stake impressions often fractures the housing.

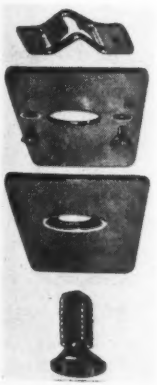
An aluminum alloy bushing is therefore inserted between the bearing and the magnesium alloy housing and its edges are spun simultaneously over the chamfer on the bearing and into a countersink around the housing.

Spinning requires continuous revolutions of the swaging tool, first on one side and then on the opposite side of the housing.

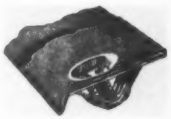
The Carlso Self-Aligning Spring-loc Fastener

A lightweight, self-aligning, springloc fastener of unique design which offers many advantages over the present cross pin type fastener has been developed by Carl P. Sorensen, chief standards engineer of The Glenn L. Martin Company, and will soon be made generally available. Known as the Carlso after its inventor, the new fastener was originally designed to overcome difficulties in the attaching of aircraft cowlings, but has since demonstrated its adaptability as an all purpose fastener for both aircraft and non-aircraft applications.

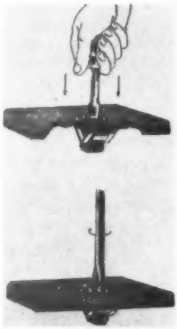
The Carlso fastener consists of two parts, a stud and a receptacle. The former has a squared shank on which two opposed sides are serrated, while the latter is of spring clip design and engages the serrations in the manner of a ratchet to secure the stud in place. Since the serrations run the full length of the stud and the receptacle is extremely flexible, it is possible to use one length of stud for all applications as against anywhere from 30 to 40 lengths required with fasteners of the cross pin type. Likewise, this permits starting the studs with the two pieces out of alignment and letting them align themselves as the studs are driven home.



To fasten a cowling with the new fastener, it is first brought into approximate visual alignment; since there is no cross pin, the stud can be removed to permit visual installation, although a horseshoe washer may be used to keep the stud in the dimpled hole when desired, and then the studs are started one at a time. After all studs have been started in their respective positions, they are then driven home with a screw driver, a single sharp tap sufficing for each stud. In this way it is possible to draw the cowling uniformly into place in the same manner that a cylinder block is tightened.



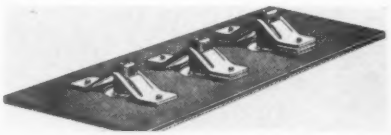
To remove a cowling fastened with the new Martin device, it is only necessary to turn the studs a quarter turn to either side to disengage them. But while the studs are easily disengaged when desired, it is impossible for them to loosen due to vibration.

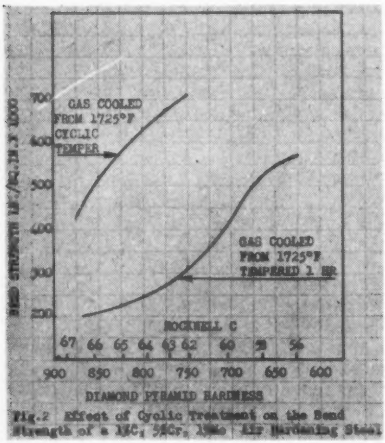


With a single receptacle it can withstand loads in excess of 900 pounds, and this can be further increased by stacking or nesting two or three receptacles to engage a single stud.

In addition to cowling attachment and similar aircraft applications, other uses for which the new fastener is adapted range all the way from attaching automobile crank cases and auxiliary freight car doors to inspection plates, heating and ventilating ducts, grain storage bins, and portable sheet metal buildings.

The Carlso fastener is more easily and cheaply fabricated than present type fasteners.




GAS COOLED FROM 1725°F CYCLIC TEMPER
GAS COOLED FROM 1725°F TEMPERED 1 HR
ROCKWELL C
67 66 65 64 63 62 60 58 56
900 850 800 750 700 650 600
DIAMOND PYRAMID HARDNESS
Fig. 2 Effect of Cyclic Treatment on the Bend Strength of a 1.5% 5%Cr, 1% Air Hardening Steel

(CONTINUED FROM PAGE 103)

final temper to the desired hardness. Evidence has been offered for high speed steel, showing that all of the austenite may be transformed by tempering one or more times at the usual temperature (1050°F) with cooling to room temperature following each such heating. The amount of austenite that will transform is dependent on the time at the tempering temperature, and the effect on the properties of the progressively reduced amounts resulting thereof is shown in Table I [from Cohen (8)], see page 114.

The effect of these improved properties has been substantiated by actual shop results where reduced breakage and edge chipping, longer cutting life, and more blanks per grind have all been obtained.

As previously pointed out, it is usually desirable to have the transformation take place at relatively low temperatures (under 300°F). This necessitates a note of caution, since steels containing considerable proportions of austenite are provided with a "cushion" of high plasticity for accommodation of considerable stress. If this "cushion" is removed, particularly at very low temperatures where plasticity in general is quite low, stresses resulting from natural dimensional changes occur which connotes a serious cracking hazard. With these facts in mind then, an approach to practical application of sub-zero treatments can be made.

For carbon or moderately alloyed steels of medium carbon content such as SAE 1045, 4140, 4340 and NE equivalents, the practical value of sub-zero cooling is questionable because the amounts of retained austenite are either nil or relatively small. Furthermore, in most engineering applications of steels of this type, tempering temperatures are fairly high and hardness consid-

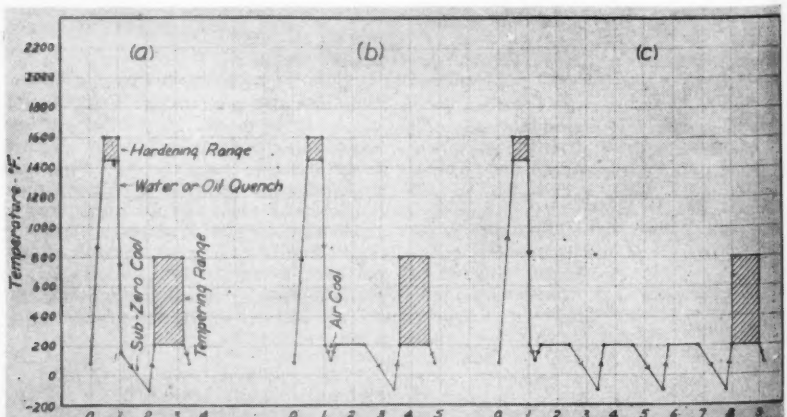


Fig. 3 Cycles for Water and Oil Hardening Tool Steels, Alloy Carburizing Steels, SAE 52100

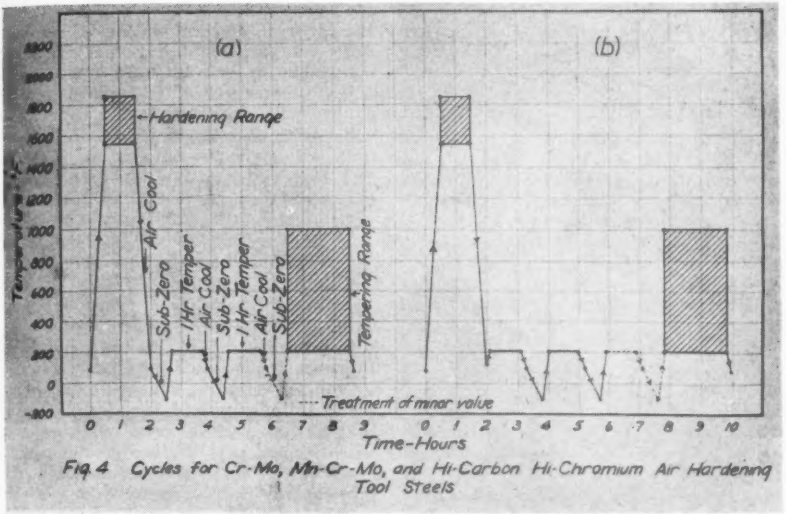


Fig. 4 Cycles for Cr-Mo, Mn-Cr-Mo, and Hi-Carbon Hi-Chromium Air Hardening Tool Steels

erably reduced, wherein the conversion of the austenite to bainite would not be objectionable. Bainite, untempered or tempered, is known to have excellent properties for applications not requiring maximum hardness.

On water and oil hardening tool steels, alloy carburizing steels, and other low alloy high carbon steels such as SAE 52100, the treatment has been found frequently beneficial. Typical cycles are illustrated in Figure 3. In general, cycle (a) is satisfactory for virtually all alloy carburizing steels and, in some cases, the other steels as well. Cycles (b) and (c) offer considerably reduced danger of cracking, particularly where sharp corners or edges are present or where the part has hardened throughout the cross-section. Cycle (c) is especially advantageous for gages since it offers the greatest degree of stabilization. In all cases, the final temper is the last operation and this is true of all subsequent treatments discussed. The curves indicate actual steel temperature. While the time relationships are not intended to be exact (except where specifically stated), it is significant to note that it is not deemed necessary to hold the steel at the sub-zero temperature for any appreciable length of time. It is important, however, that the steel reach the temperature given.

Treatments for the highly alloyed die steels, as shown in Figure 4, are very

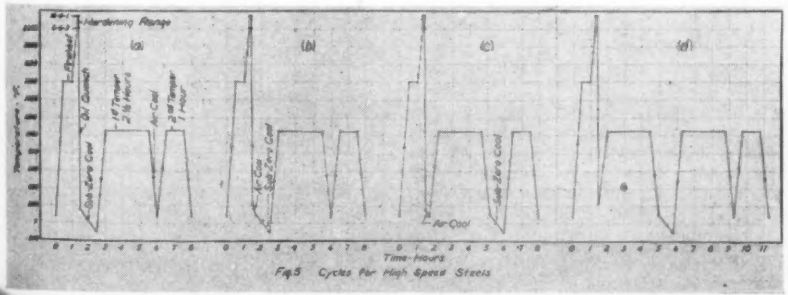


Fig. 5 Cycles for High Speed Steels

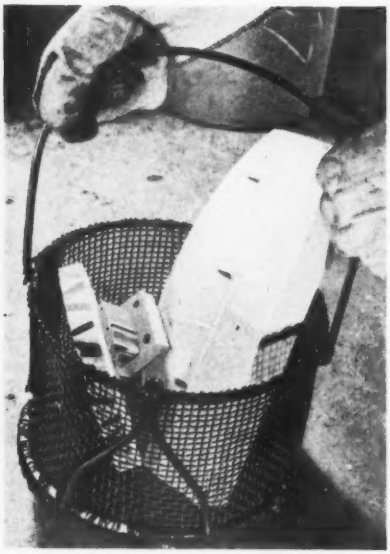


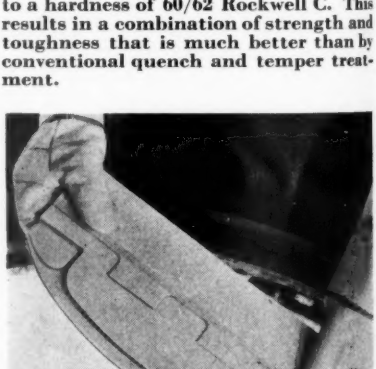
Fig. 6 — Hubbing master and milling cutter following the sub-zero treatment. Each was hardened in the conventional manner, then tempered, then cooled in the sub-zero chamber. Additional tempering will produce a combination of strength and toughness that is much better than by conventional quench and temper treatment.

similar except that two and sometimes more immersions in the sub-zero cooling medium are necessary to obtain optimum properties since the austenite is considerably more sluggish (that is, resistant to transformation). Somewhat inferior properties result from cycle (b) as against cycle (a) due to "aging" (subsequently explained in the discussion on high speed steel). Cycle (b) does, however, offer greater freedom from the cracking hazard.

Since steels that have been sub-zero treated have considerably greater strength at a given hardness they may be used at higher hardness than with ordinary heat treating practice. By the same token, if breakage in service had been a serious problem previously, tempering to the same hardness as used with conventional treatment will produce much greater toughness.

Figure 5 illustrates several cycles for high speed steel. The regular salt bath technique may also be employed, the only difference being the air cool from the customary quench into a salt bath held at a temperature of approximately 1100°F. High speed steel, however, because of some anomalous behaviours, requires additional explanation. Cycles (a) and (b) are of equal effectiveness and would seem most likely to produce the best results in performance of all the heat treatments given. It should be pointed out, though, that this is not definitely established. Berlien (9) and DePoy (10) have obtained opposing results on independently conducted service tests. Cohen (8) reported, however, that beneficial results have been obtained by sub-zero treating finished tools, which seems to indicate an "X" effect or factor that has, as yet, not been explained. It will be noted that even when the cooling is more or less continuous from the quench to the sub-zero temperature, double tempering is recommended. Cohen (6, 8) has shown this to be because the

Fig. 7—Hubbing master of hi-carbon hi-chromium tool steel for sinking plastic mold die cavities. It is hardened in conventional manner to 65 Rockwell C; tempered in boiling water for one hour; cooled to minus 100°F in sub-zero chamber; warmed to room temperature; and tempered at approximately 900°F to a hardness of 60/62 Rockwell C. This results in a combination of strength and toughness that is much better than by conventional quench and temper treatment.



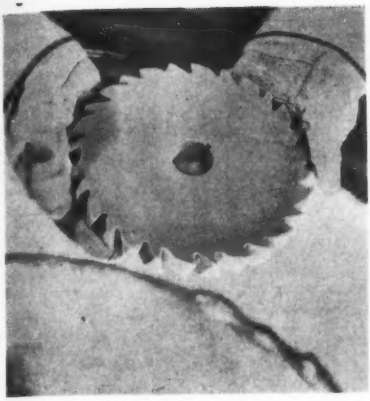


Fig. 8—Milling cutter of hi-speed steel being removed from sub-zero chamber. It was oil quenched from 2350°F then tempered at 1050°F for 2½ hours before the sub-zero treatment. The milling cutter will be ready for use following another temper of one hour at 1050°F.

first cool still leaves approximately 9 percent of the austenite untransformed and no amount of time or a lower temperature will appreciably alter this condition. According to Cohen and Koh (11), it is, therefore, necessary to "condition" the remaining austenite by the first temper, so that it will transform on cooling to room temperature. Of course, it is desirable to stress-relieve this last formed martensite for best properties, hence, the second temper.

It is appreciated that many tools, particularly large ones of complicated section and/or containing sharp corners or edges, would be prone to cracking if given either treatment (a) or (b). Hence the treatments shown by cycles (c) and (d) are offered. These may not produce properties equal to cycles (a) or (b), as pointed out above, but the improvement over conventional practice is considerable and they do provide a means of treating shapes that would be certain to distort or crack if sub-zero cooled directly.

In carrying out any of the treatments illustrated, the steel should not be held at or near room temperature for any appreciable length of time before sub-zero cooling, since the austenite becomes stabilized through an "aging" phenomenon, and thereby becomes increasingly difficult to decompose. Gordon and Cohen (6) have shown that holding for as short a time as one hour has a detrimental effect and ten hours reduces the efficiency of the sub-zero treatment fifty percent. Furthermore, arresting the quench above approximately 225°F is not recommended since a majority of the austenite would then not be transformed until the steel is cooled from the tempering temperature with an even greater hazard of cracking. Specific tempering times are given for high speed steel because they are of considerable importance. According to Cohen (8) the first temper, if less than 2½ hours at 1050°F, will not permit sufficient precipitation of carbides at the tempering temperature to allow for complete transformation of the retained austenite on cooling, while more than three hours causes some loss in both room temperature and hot hardness, strength, and toughness.

In closing, it is felt desirable to add some further precautions that have been dictated by actual experience. Since the

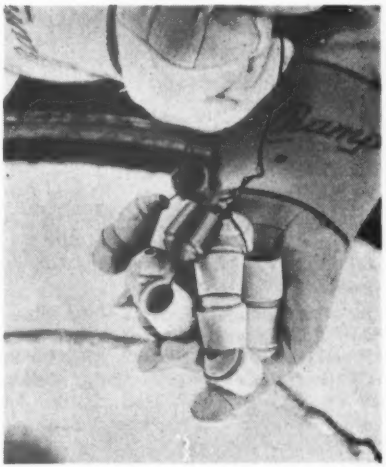


Fig. 9—Shaving dies of hi-carbon hi-chromium tool steel. They are hardened to 65 Rockwell C; tempered for one hour in boiling water; and are brought to 67/68 Rockwell C by sub-zero treatment at minus 100°F.

distortion and cracking hazard is ever present when transforming austenite to martensite at such low temperatures, it is desirable that the temperature of surrounding the part with one or more layers of heavy wrapping or asbestos paper before insertion in the cooling medium to slow up the cooling somewhat.

TABLE I

TEMPERING 18-4-1 HIGH SPEED STEEL AT 1050° F

		Hardness	Transverse Strength	Torsion Impact	Hot Hardness*
Single Tempering	6 min.	65.1 Rc	312,000 psi	16 ft-lbs.	55.0 Rc
	½ hr.	65.7	270,000	30	57.0
	2½ hrs.	65.0	408,000	48	58.0
	5 hrs.	64.5	410,000	48	57.0
	24 hrs.	63.8	.....	39	55.0
Double Tempering plus	2½ hrs.	64.5	454,000	63	57.0
	2½ hrs.				

*Hot Hardness measured at 1000° F

the part be as uniform as possible to prevent additional thermal stresses. Many users of the process have, consequently, employed the practice of Users are also cautioned to avoid making hardness tests, particularly with heavy indenters, until the part has been tempered.

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Threads in Plastics Parts

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Screw threads can be either molded into a plastics part or they can be machined in the part. Molded threads are always stronger than machined threads, particularly with thermosetting materials, and are much better in appearance. So far it has not been practical to roll threads into plastics because the materials are not malleable enough and the accuracy would be very poor.

The strongest of molded threads are about one-third the strength of aluminum or duralumin threads or parts when considered in torque. Thermoplastics threads are only from one-fifth to one-fiftieth as strong as aluminum for the same size threads, depending upon the type of thermoplastic material. Obviously, threads molded in softer plastics materials will have weaker shearing strengths. In all cases where molded threads are not strong enough threaded metal inserts should be molded into the part.

Molded or Machined

Some advantages of molded threads over machined threads in plastics are:

(1) Higher strength
(2) Faster production (in most cases)
(3) Better appearance
(4) Lower friction
(5) Easier to assemble (with proper thread form)
(6) Better dimensional stability
(7) Less moisture absorption
(8) Lower cost

Thermosetting threads are far superior in strength to thermoplastic threads because of the greater material hardness and absence of cold flow properties. Molded thermosetting threads are much stronger than machined threads in the same material due to the skin strength or "case hardness" characteristic of thermosetting plastics. When this "case hardness" is machined away the core beneath it is found to be softer and of lower strength. This explains why molded threads usually do not strip. The molded part breaks through the body before the threads will strip unless there is sufficient wall thickness around the molded thread to prevent breaking.

Production of molded threads can be faster than machined threads (including those made on an automatic screw machine) when it is practical to use molds of many cavities equipped with automatic unscrewing devices.

Molded threads are smooth and glossy if the mold is made properly, and the thread friction is very low.

Dimensional stability is better when

thermosetting materials are used because a molded surface resists moisture absorption and because strains are not set up in the material by machining. The moisture resistance is better because the plastics resin comes to the molded surface and keeps the moisture or liquids away from the filler in the molding material. Fillers absorb moisture and moisture causes swelling and loss of dimensions.

In comparing the costs of molded plastics with screw machine products let us take plastics fittings as an example. Molded phenolic fittings cost about *half* the price of aluminum fittings of the same size and shape when the latter are made on an automatic screw machine. An automatic screw machine is by far the lowest cost process for machined threads of any kind. A lathe is much slower.

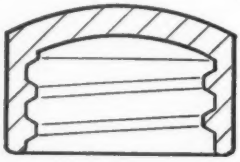
The three general methods of forming threads are:

(1) By the use of a one-piece thread ring or thread core; which is unscrewed after molding.

(2) By molding the thread on its side (axis of the thread parallel to and on the parting line) and between the two halves of the mold.

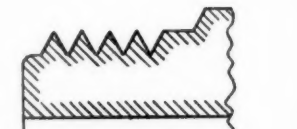
(3) By "bumping" or stripping rounded threads from the mold.

The second method is faster in production than the first because no parts have to be unscrewed. The mold is parted directly on the threads. There are three disadvantages, however, to this method.



BOTTLE CAP THREADS

Fig. 1—Bottle cap threads are thicker, after rounded, and are wider apart than V-threads because they are usually stripped from the mold rather than unscrewed.



SKIN STRENGTH OF MOLDED THERMOSETTING THREADS

Fig. 3—A "case hardness" is formed on the surfaces of molded thermosetting materials which adds to thread strength.

First, the accuracy of such threads depends upon the mold register of the two die halves when they close. As the mold wears it loses in accuracy. Where the two halves of the threads come together they are staggered slightly relative to one another. This cannot be avoided as the mold parts or guide pins wear.

Second, the flash must be removed from the threads after the die begins to wear.

Third, standard pipe threads molded with flash along the threads will leak slightly at the flash line after tightening.

The first method, a continuous thread made with a ring or core, eliminates the above troubles and produces by far the most accurate and best appearing threads. The thread rings or cores can be unscrewed from the molded parts either manually or automatically. If the volume of production is large enough the automatic unscrewing of threaded parts as the mold is opened soon pays for itself in man-hours saved. A compromise with multiple cavity molds is to use an air or electric operated motor to unscrew the molded parts from the mold.

The bumping or stripping of threads from the mold without unscrewing is applicable only to rounded threads such as are used on standard bottle caps. These are special threads as established by the Glass Container Association of America. Special plastics materials must be used for this purpose particularly if thermosetting materials are required. These materials should remain

somewhat soft and flexible at the time of ejection in order to distort over the threads and return to their original shape immediately after stripping. Standard V-threads should never be stripped as the tips of the threads will be sheared off in the process. Round edges or thick tapered threads must be used to withstand the shearing.

Standard V-Thread Terms

Dimensions and specifications for standard V-threads of all sizes can be found in any engineering or shop handbook. Following is an explanation of some of the terms involved which must be understood by one who designs or specifies threads of any kind.

These terms are:

(1) Pitch and lead
(2) Pitch diameter
(3) Major diameter or basic diameter
(4) Minor diameter
(5) Depth of thread
(6) Width of flats
(7) Percentage of thread
(8) Thread size or diameter
(9) Threads per inch
(10) National Series
(11) Class of fit

Pitch is the distance from a point on a screw thread to a corresponding point on the next thread measured parallel to the axis. It is sometimes referred to as the number of teeth per inch of length along the axis. *Lead* is the distance a screw thread advances axially in one turn. On a single thread screw the lead is equal to the pitch but on a double thread screw the lead is twice the pitch, etc.

Pitch diameter is the diameter of an imaginary cylinder near the middle of the thread that passes through the thread in such a way as to make the width of the threads and the width of the spaces between threads equal.

Major diameter sometimes referred to as basic diameter, or stock diameter, is the largest diameter of the threads taken at the outermost part. It is also the "size" of the thread commonly specified.

Minor diameter is the smallest diameter of a thread.

Depth of thread is the distance from the outermost point or crest of the thread to the root of the thread and is calculated by subtracting the minor diameter from the major diameter and dividing the result by two.

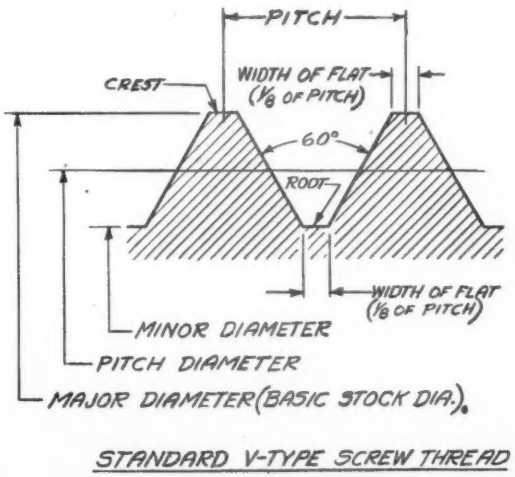
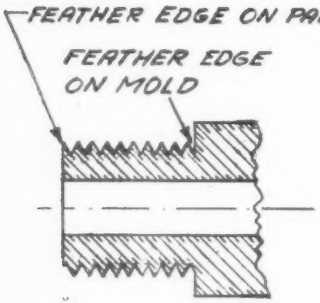


Fig. 2—Measurements and nomenclature of standard V-type threads.



POOR THREAD DESIGN

Fig. 4—Feather edges should be avoided on thread ends of molded parts and molds.

Width of flats is the width of the flats across the tips of the threads at the major diameter and the width of the flats across the root of the threads. This is theoretically equal to one eighth of the pitch for all American Standard screw threads.

Percentage of thread is the percentage of actual contact area between two mating threads in comparison with 100 percent contact of theoretically sharp pointed threads of full "V" shape at top and bottom. Percentage of thread = 115.5 x Threads per inch x Depth of thread. Most standard threads contact about 75 percent.

Thread size or diameter is the general specification for the thread diameter and is equal to the major diameter. For one-fourth inch and above, thread sizes are specified as fractions. For sizes below one-fourth inch, threads are usually specified by a standard "number" selected for the diameter.

The National Series of thread forms is the American Standard Thread Form. Specifications for "coarse", "fine", "extra fine", etc., are found in standard tables available in handbooks and in the literature of many manufacturers. These are abbreviated as "NC", "NF", "EF", etc.

Class of fit is the looseness or tightness of engagement of two mating threads. Class 1 fit is a very loose fitting thread and Class 4 fit is a fine snug fit. It may be described as the "clearance" of fit or engagement clearance. Standards are established for these fits and the tolerances for production are governed by these standards. The higher the class of fit the closer the tolerance. Usually a Class 2 fit is the practical limit for plastics. Class 3 fit can only be achieved with extreme caution with materials, molds, and production techniques, and consequently is costly. The fit of a thread with a mating part is dependent only upon the sizes of the pitch diameters and never upon the major or minor diameters.

Thread End Contour

A "feather edge" end of a thread should never be permitted on a molded plastics part for many reasons. They chip easily in use, are difficult to start during assembly, and usually allow a corresponding feather edge on the mold parts which can also be easily chipped, resulting in an undercut. In this case the molded piece cannot be unscrewed from the mold.

A thread should end abruptly at the leading end and with a radius. This allows almost a full thread to the end.

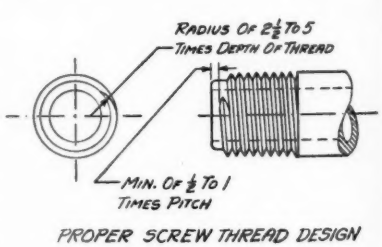

RADIUS OF 2½ TO 5 TIMES DEPTH OF THREAD
MIN. OF ½ TO 1 TIMES PITCH
PROPER SCREW THREAD DESIGN
MIN. OF ½ TO 1 X PITCH
PROPER NUT THREAD DESIGN

Fig. 5—Correct thread end contours for molded screw and nut threads. Feather edges should be avoided.

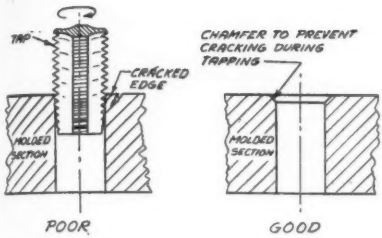


Fig. 6—Entrance to tapped holes should be chamfered to prevent chipping during tapping.

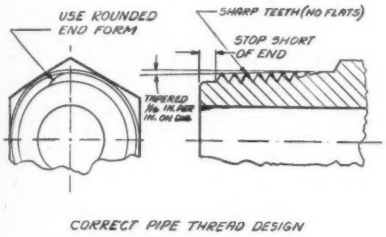


Fig. 7—Standard pipe threads are tapered and have sharp teeth at both crest and root.

For an external thread the crest of the thread should turn down and disappear into the cylindrical surface of the minor diameter with a radius of from 2½ to 5 times the normal depth of the thread. This is easily accomplished in tooling by withdrawing the cutter at the end of the threading cut (the thread being cut as an internal thread in the mold). For an internal thread on a molded part the radius is not needed. In this case the crest may run out tangent to and in a straight line from the crest diameter or minor diameter and disappear into the cylindrical surface of the major diameter. The thread core of the mold is the reverse of the thread that it produces in the molded part and the cutter that makes the thread on the core can be withdrawn during the tooling of the thread to produce this effect.

Advantages of rounded-end threads are:

(1) No "feather edge"
(2) Less molding troubles
(3) Easy to start thread at assembly
(4) Will not chip or break
(5) Stronger threads at start
(6) Better appearance
(7) No chipping of threads on mold parts

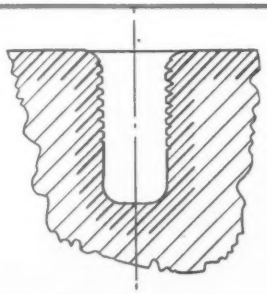
When a thread ring is used for molding an external thread on the molded part the thread should always be chamfered or radiused at the mouth of the thread ring if possible to prevent "feather edge" at the end of the mold thread. Such a "feather edge" could easily be chipped by laying the thread ring on an object during molding or during work on the mold. Such chipping produces undercuts and prevents unscrewing of the molded part from the ring. The mouth of the thread on the thread ring produces the *back* end of the thread rather than the leading end on the molded part, and the chamfer or radius would appear on the molded part at the back end of the thread and should be designed accordingly.

Rounded-end threads can be produced either on a lathe, milling machine or grinder. Milled threads are generally the most practical. Ground threads are, of course, best but are more costly to produce.

Both the leading end and back end of any thread should stop short of the end of the threaded portion. The leading

(TO PAGE 128—PLEASE)

Fig. 8—Maximum thread strength from self-tapping screws can be achieved by tapping into the hardened surface of a molded hole.



THREADS TAPPED INTO MOLDED HOLE

Extruding Dies For Cellulose Materials

★ ★ ★ ★ ★ ★ ★ ★ ★

by W. O. Lawson

Plastics Department

E. I. duPont de Nemours & Co., Inc.

★ ★ ★ ★ ★ ★ ★ ★ ★

The process of extruding plastics materials is one of the oldest in the industry. J. W. Hyatt, who invented cellulose nitrate (celluloid), the first plastic, was granted a patent in 1872 covering two forms of extrusion—extruding through an orifice or die to form a continuous rod, bar, sheet or tube and extruding into a mold.

No major changes have been made in the basic machine. Except for mechanical refinements, the hydraulic extrusion press of today is basically the same as its early predecessor. About 1880 with the introduction of the screw propelled extruder by John Royle & Sons, still a leading manufacturer, the "tuber" was used first in the rubber industry for the fabricating of rubber hose and tubing. Since that time the extruder has been used for the manufacture of a great number of rubber and synthetic rubber products.

The next plastic to be extruded, about ten years later, was casein rod, from which blanks were cut to be used in the making of buttons, checkers and other objects of the same approximate size. A little later the extruder found its real usefulness in the handling of cellulose nitrate and then cellulose acetate materials.

Wet and Dry Extrusion

Cellulose materials extruded at slow screw speeds and low temperatures required a relatively long curing period, sometimes of weeks, before they could be used. This so-called "wet" extrusion is done by only a limited number of organizations.

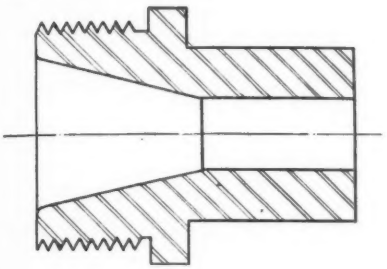
The "hot" or "dry" extrusion of thermoplastic materials is so called because of the higher screw speeds, high, closely controlled temperatures and the fact that the plastics material in granule, powder or strip form is fed into the extruder loading hopper perfectly dry. The latter is important because the finish of the extruded part is dependent upon the moisture content. It is necessary to thoroughly dry thermoplastic materials before they are used. The curing is rapid, being speeded by infra-red lamps or by drying ovens. The drying temperature and interval are both precisely controlled.

The extruding machine is essentially a device for forcing stock through a cylindrical tube under heat and pressure and out through a shaping die. The hydraulically actuated ram type called a "stuffer" operates intermittently since the ram must be retracted for each charge. The mechanical or "screw" extruder, on the other hand, operates continuously as long as the material is fed into the hopper and the machine operates.

The speed of the mechanical screw can be varied for each material or die cross section. The drives are flexible enough to take a wide range of material. Extrusion temperatures are critical. Accurate control of the cylinder temperature, sometimes by zone heating, if progressive heating is desirable, and of the head or die holder is essential. If zone heating is used the section nearest the hopper is often water cooled so that the stock remains in the solid state to resist back pressure. Circulating oil is generally considered the most practical all around heat source.

Extrusion dies are much simpler than, for example, injection dies. Most extrud-

Fig. 1—A plain round extruder die. This design is attached directly to the extruder.



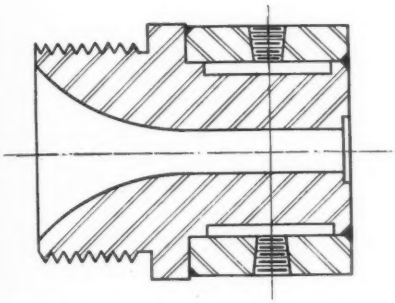


Fig. 2—The jacketed construction shown is usually necessary to control the temperature of the die.

ing is done in a single orifice or form rather than multiple. Extrusion dies may be made from low carbon steel or bronze. When it is necessary to design for high pressures, a better grade of steel is used to insure a high tensile strength. All dies should be highly polished on all surfaces that come into contact with the plastics material. This reduces friction and makes for better surface finish. When chrome plating is to be added, it should follow a tryout or trial run that has ascertained the accuracy of the dimensions.

Stock allowances should be made on extruder dies for final fitting at tryout. A few thousandths is usually sufficient. The action of the material as it leaves the die face is also a factor. The width of a die for a flat strip is usually 10 to 15 percent wider than the finished strip. Small cross sections are commonly extruded in a parallel line of orifices slightly larger (.012" thread would have .020" orifices) than the desired cross sections. In both cases an accurate stretching down action, carefully controlled by the speed of the conveyor belt, gives the desired results.

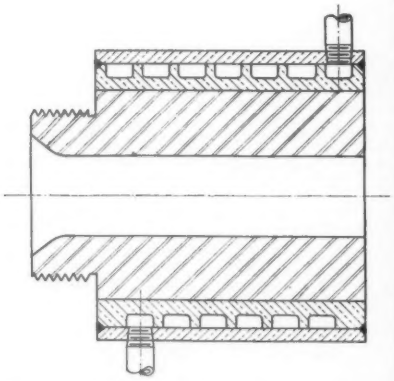


Fig. 3—This design is similar to Fig. 2. Circulating oil or steam is utilized for heating.

A plain round extruder die is illustrated in Fig. 1. This particular die is designed to be attached directly to the extruder. Rod dies are also made in the shape of shoulder type bushings that are fitted into adaptors.

Figures 2 and 3 illustrate typical jacketed die construction. Oil heating systems are in common use. In many cases the oil is heated by electric immersion heaters and pump circulated.

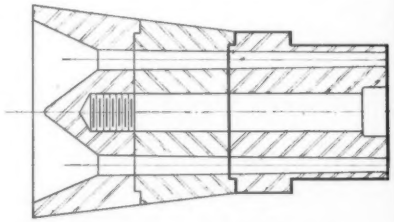


Fig. 4—This design is typical for the production of a number of small strands. The three sections are bolted together. The die part, in heavy outline, can be reamed to the diameter required and is interchangeable with other dies of various diameters. It is customary to provide as many orifices as possible, spacing the holes on center distances of 1½ to 2 diameters of the strand.

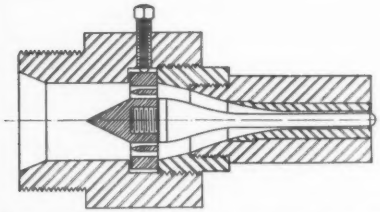


Fig. 5—This tubing die consists of three adapters, a bushing type die, a pin for forming the hole and an adjustable breaker plate. Three or more set screws, one of which is shown in the sketch, are adjustable to insure concentricity.

Fig. 6—A modern high temperature screw type extruder with hinged side delivery head. This 6" bore unit has a worm gear reduction drive.

Zone heating of the cylinder is also usual with the greater heats at the die or outlet end. For most materials the die itself is kept heated at the highest temperature held in the cylinder.

Tubing die parts are interchangeable; the core pins and bushings determine the size and thickness of the tubing.

Figure 4 is a typical design of a multiple orifice die. As many orifices as practical are usually used to avoid excessive pressures which might otherwise build up. This, in turn, makes it advisable to do the work on the proper size extruder. Using an oversize extruder with orifices too small to extrude at the proper rate for a given material may result in damage to the extruder.

The introduction of some of the new plastics and synthetic rubbers is steadily increasing the production of extruded parts and products. Applications for our armed forces have made hot extrusion an important industry. Special wire coating extruders, for example, have made a notable gain which is expected to continue because of the superior characteristics of plastic coated wire. With tailor-made materials now available on a specification basis, improved extruding machines and correctly designed, easily interchangeable dies, the extrusion process will continue its important role in the postwar period.

Heat Treating Of Hobbed Cavities

An excellent illustrated booklet* just released by Midland Die & Engraving Co., 1800 W. Berenice Ave., Chicago 13, Ill., and directed to purchasers of Midland Hobbed Cavities gives clear step-by-step procedure for carburizing, quenching, cleaning and annealing. The booklet has been prepared by Midland metallurgists as a guide for holding hobbed cavities against dimensional changes and to assure users of Midland Hobbed Cavities of maximum and low cost production of precision parts.

A chart that shows the relation of carburizing temperature, soaking time and depth of case, with suggested soaking time limits for thermoplastic injection molds and for thermosetting molds, and another that indicates the relationship of cubic content in inches of hobbed cavity blocks to temperature in degrees F when reheating in a slightly carburized salt bath, are of definite reference value.

Procedure in quenching both shallow and deep hobbed cavities is given pictorially. Drawing procedure to give the most satisfactory hardness for hobbed cavities (Rockwell C 56-58 for both injection and compression molds) is outlined. For final cleaning after the draw a good commercial cleaner is recommended, although boiling water may be used. The cavity then should be dipped in a good grade of rust preventive to save subsequent polishing.

The annealing procedure recommended when it may become necessary to modify or change the design of a hobbed cavity is given in easily followed detail.

Extra copies are available to Midland customers for guidance in their shops and for distribution to heat treaters who do work for them.

*"How to Heat Treat Hobbed Cavities by Midland."

Durez Phenolic Aids Synthetic Rubber Processing

The processing of synthetics to reproduce the characteristics and properties of hard and semi-hard rubber stocks as produced from natural rubber is one of the toughest problems confronting the synthetic rubber industry.

The resourcefulness of American chemical science has again been demonstrated by finding the solution to this problem. A method of processing most synthetic rubber with a Durez phenolic resin has been developed by research engineers of the synthetic rubber manufacturers and the plastics industry. Very excellent hard and semi-hard rubber stocks can be produced by this process. The use of this resin has been confined to date to two synthetics, Buna S and Buna N. It is known, however, that the resin is compatible with neoprene and with natural rubber. Its use with other synthetic resins is being investigated. Typical of American industry is the cooperation of these research engineers, and this combining of chemical ingenuity has definitely contributed much to the progress of synthetic rubber. The versatility of the plastics industry has been further demonstrated.

A very useful characteristic of a Durez thermosetting phenolic resin, recently formulated, is its ability to soften synthetic rubber during the milling or processing of semi-hard and hard rubber compounds. It has been difficult to add sufficient loading during milling to produce the semi-hard and hard rubber stocks because of the peculiar stiffness of synthetic rubber as compared with that of natural rubber during such processing. Loading with reinforcing materials such as carbon black was not a problem in the production of these stocks from natural rubber because of the natural plasticity of the rubber on the mill. Being thermosetting and completely compatible with the synthetic rubber, the Durez resin also reinforces the rubber in much the same manner as carbon black. Stocks of high tensile strength, a high degree of hardness, good elongation, and low-temperature flexibility are therefore produced. The amount of reinforcing agents normally required to give a definite hardness can either be entirely eliminated or reduced proportionately depending entirely upon the amount of resin used.

As an example, a Buna N stock having 50 parts of Durez resin on 100 parts of rubber, and normal sulfur and accelerator content, gives the resulting vulcanizate a hardness of 92, a tensile strength of 2600, and an elongation of 300%. This material passes the ASTM freeze test easily without breaking. To soften the compound on the mill a smaller percentage of the resin could be used and carbon black added in sufficient quantity to secure the hardness.

Made by this method, hard rubber stocks machine readily and it is only natural that oil and heat resistance would be improved because of the inherent oil and heat resistance of the Durez resin when thoroughly cured. It is only logical to assume that it will serve as an anti-oxidizing agent, since the resin is also inherently unaffected by oxygen.

The new hard and semi-hard rubber stocks made from the combination of Durez resin and synthetic rubber are not claimed to excel those made from natural rubber; the major point, however, is that such stocks having uniform and balanced properties can now be processed from synthetic rubber.

This same resin, it is interesting to note, is known to be compatible with natural rubber, and the future possibilities of this knowledge are almost beyond conjecture.

PUBLICATION PREVIEWS

Use our postage-free Inform-a-Gram for your request

CUTTING PLASTICS WITH CIRCULAR SAWS is the title of a well illustrated 32-page booklet issued recently by Simonds Saw and Steel Co., Dept. TD, Fitchburg, Mass. The booklet covers the basic principles that apply to the proper selection and use of circular saws for cutting plastics.

Several types of cutting machines and circular saws are illustrated and described. Liberal space is devoted to suggestions for proper saw operation including diagrams showing maximum and minimum projection of saw through the cut in its relation to burning and chipping, a diagram showing clamp arrangement on which a hold-down spring is mounted to prevent chatter and several showing proper and improper alignment of guide fences and use of stiffening collars and spreading bar.

It also includes diagrams showing hook of teeth and charts of circular saw tooth spacing with two methods for finding the number of teeth by diameters, also an explanation and specifications for determining the diameter and thickness of saws to use under various conditions.

INFORM-A-GRAM KEY No. C99-W

LISTS OF PLASTICS applied on surfaces of metal, fabric, wood, electrical cable, and plastic articles are described and illustrated in a 44-page booklet issued by Roxalin Flexible Finishes, Inc., Dept. TD, Elizabeth, N. J. The following specifications are given after each article described: its trade name, color, appearance, gloss, application, drying and curing range. Also given is a list of the article's desirable properties. Roxalin Crusader Enamel applied on the body of flying boats is one of the uses of plastic as a coating. Since Crusader Enamel gives the flying boats a tough, abrasion and corrosion resistant skin, it adheres through rough landings. Roxyn 10.B is used as a protective coating on steel cartridge cases. This coating is chemical, abrasion, corrosion and wear resistant, and flexible enough to prevent chipping under sharp impact or knurling. Many other uses of plastic coatings are described and illustrated.

INFORM-A-GRAM KEY No. D2-W

LUMARITH, VINYLITE, AND ETHYL CELLULOSE are described and illustrated in an 8-page booklet issued by The Hopp Press, Inc., Dept. T, 460 West 34th St., New York 1, N. Y. All three of these materials are versatile and available in an unlimited variety of colors from clearest transparent to deepest opaque. New and better machinery has enabled The Hopp Press to perform the following operations: sheet fabrication, plastic printing, lamination, die making, injection molding, and extrusion molding. A general properties chart is included in the booklet.

INFORM-A-GRAM KEY No. D1-W

EXTRUDED, LAMINATED, AND FABRICATED PRODUCTS manufactured by the National Plastic Products Co., Dept. TJ, Odenton, Md., are described and illustrated in an 8-page booklet.

Among the many extruded products are Saran pipe and tubing. In addition to tubing and fittings, Saran is extruded as a monofilament for furniture webbing, filter cloths, screens, and as woven and braided tapes. Tubings and fittings from ⅛" to ¾" are now in production.

The laminated plastic materials may be used for electrical insulation, mechanical application, and for decorative purposes. The decorative laminate type of material is available in both opaque and translucent forms, and will withstand a great deal of wear and will not spot with fruit acids, alcohol, mild alkalies or other solvents.

Charts are included on electrical and thermoplastic properties; chemical resistance of Saran; sizes and weights of Saran tubing and pipe. Illustrations of structural and decorative shapes of dies are also included.

INFORM-A-GRAM KEY No. C98-W

TORQUE TOOLS, designed to give accurate and minute tension readings for assembly work and laboratory testing, are illustrated and discussed in the booklet "Facts & Figures on Torque Tools" issued by the Apco Mossberg Co., Dept. D, Attleboro, Mass. The small series or handle scale type and dial indicator type of tools are standard. In addition the new Palm Rest Torque Tool, designed for use where careful balancing is necessary, is available. One hand balances the torque tool while the other can apply the torque at the handle. The charts that are included can be used as guides in determining the range of torque for certain products.

INFORM-A-GRAM KEY No. C1-W

RESILON, a resinous thermoplastic material which resembles rubber in many physical characteristics, is described in Bulletin 1502, issued by The United States Stoneware Co., Dept. J, Akron, Ohio. Resilon, suitable for many corrosive applications, is used for most

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Stripcoat Protection for Metal Parts

Stripcoat, Dow Chemical Company's ethyl-cellulose coating compound, streamlines four packaging operations heretofore necessary into one process. The articles illustrated show how the various metal parts appear after their dip into Stripcoat. In this state they are ready for shipment to their destination, where

they will be ready for immediate use after the Stripcoat covering is slit and removed—no degreasing operations are necessary. Formerly preparation of such parts for shipment involved: 1. Application of preservative. 2. Cutting of grease-proof wrappers to the proper size wrap. 3. The time-consuming operation of wrapping the part. 4. Final dipping of such a package in wax.

Stripcoat can be applied by hand dipping or mechanical dipping. The latter allows more uniformity of the coat, although hand dipping is adequate in many cases, and the equipment necessary is not complicated. Stripcoat sets quickly without mechanical drying equipment, since it is dependent only upon the heat-absorbing capacity of the metal itself and the surrounding atmosphere to set, hence a few seconds after parts are dipped they can be placed on a conveyor belt and carried to the final shipping container. Once the coating sets, it will not adhere to itself or to other materials with which it comes in contact.

The resiliency of the material allows for contraction and expansion of the metals when subjected to temperature fluctuations, thus precluding rupture of the coating and consequent breakthrough of the metal.

It is claimed that use of this coating compound saves from 60 to 95% in man hours in wrapping metal parts suitable for coating.

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(CONTINUED FROM PAGE 124)

plating and pickling solutions. It possesses excellent dielectric strength, is non-porous and flexible, does not chemically alter or deteriorate with age and is unaffected by abrupt changes in temperature. Resilon is available in sheets up to as large as 32" x 50", and in thicknesses from $\frac{1}{16}$" up; as well as in bulk for "heat-pour" applications. It is also available in an emulsified form for trowling, though certain properties are lost by emulsification.

INFORM-A-GRAM KEY No. 771.5-W

PLASKON, a molding urea formaldehyde used for the manufacture of a wide range of electrical, structural and decorative products, is pictorially described in a 20-page catalog issued by Libby-Owens-Ford Glass Co., Plaskon Div., 2138 Sylvan Ave., Toledo 6, Ohio. Examples of intricate electrical and automotive work are featured. The wide range of colors offered by Plaskon; its high degree of translucency, permanence of finish, high strength-weight ratio, resistance to common organic solvents and its high resistance to arcing and tracking make it a choice material for a variety of products from buttons and cosmetic closures to huge scale housings and illuminating reflectors. Plaskon research facilities have developed Plaskon Grade 2 urea formaldehyde for rapid, economical production of certain types of molded products; Plaskon melamine formaldehyde, which is highly resistant to moisture and water; and Plaskon resin glue, for permanent waterproof bonding of wood and other materials. Numerous charts are included and a step-by-step procedure on "How Plaskon is Molded" is also shown.

INFORM-A-GRAM KEY No. C97-W

PACKAGING METAL PRODUCTS, an attractive, well illustrated booklet issued by the Dow Chemical Co., Dept. TD, Midland, Mich., gives application data on the Dow packaging materials, Saran Film and Stripcoat. Every kind and size, shape and weight of metal products, part or assembly can be packaged by one or more of the methods defined and illustrated. Unsealed treatment, sealed treatment, box-in-bag-in-box method as well as the floating bag method are described. Multi-colored, cross-sectional views of the part or product in its wrapping, with informative labeling and suggestions will prove of value to any shopman shipping war parts and materials. Charts giving descriptions of methods to be used serve as a guide to packaging.

INFORM-A-GRAM KEY No. 275-W

Plastics In Print

Plastics, Scientific and Technological

An English scientist, H. Ronald Fleck, M.Sc., F.I.C., has just completed a new plastics text which will be of interest to technicians, chemists and professional men who wish much more than an elementary book on the subject. *Plastics, Scientific and Technological* is, as its name suggests, not an attempt to present plastics from an elementary or "consumer" viewpoint. It is, rather, a technical book on plastics, ranging from history and raw materials, through methods of manufacture and testing, where each subject is treated with the intensive and thorough approach characteristic of English technical books.

The chapter headings are as follows: History of Plastics; Raw Materials; Theoretical Principles of Polymerization; The Chemistry of Plastic Materials; The Manufacture of Plastic Materials; Synthetic Elastomers or Rubberlike Plastics; The Physical Properties of Thermoplastic Materials; The Physical Properties of Thermosetting Materials; Synthetic Resins; Synthetic Fibres and Textiles; Adhesives, Plywood and Impregnated Wood; Manufacture of Dies and Moulds; The Manufacture of Plastic Articles; The Chemical, Physical and Electrical Testing of Plastics, and The Chemical Analysis of Raw Materials.

The author has been in close touch with plastics developments in both America and Europe, and for this reason many references to technical writings, systems and developments on both continents are found in his text. Mr. Fleck has attempted to present a sound collection of facts and scientific data on the maze of materials and processes included in the plastics field—to use his own words "a critical survey of the literature and a correlation of scattered data . . . of value both to chemists in the industry and to those whose professional duties necessitate a knowledge of the science of plastics." The book is published by The Chemical Publishing Co., Inc., Brooklyn, N. Y., at $6.50.

Blow Molding of Thermoplastics

In an address at the recent annual meeting of the Canadian Section of the Society of the Plastics Industry, Mr. James Bailey of the Plax Corporation gave an interesting and comprehensive report on blow molding. This process, he stated, may be classified into three general fields: (1) *The Indirect Method*, by which an existing shape such as a rod, sheet or tube is blanked out, reheated, and blown into final shape; (2) *The Diaphragm Method*, where preforms are built up from pieces and blown to final shape behind a rubber diaphragm; (3) *The Direct Method*, where molding powder is made plastic, then formed into an appropriate intermediate shape and blown into the final shape in a rapid sequence of operations.

Mr. Bailey stated that these three methods might be further differentiated by their objectives, the first being to change or refine the shape of some stock item, the second the same, with the added requirement of better distribution, and the main objective of the third is to produce by mass-production methods.

The steps in the blow-molding of plastics were compared with the blow-molding of glass, and Mr. Bailey stated that the radical modifications in adapting glass-blowing methods for plastics work are made necessary for the most part by the fact that plastics begin to decompose on reaching the range of viscosities corresponding to the upper viscosity limits in glass, and the pressures involved in the plastics machines must be increased to make up for the greater stiffness.

As compared to glass, the cost of blown plastics containers is high; but Mr. Bailey believes that with the development of faster, cheaper and more efficient methods of manufacture, and the promotion of such applications for the plastics articles as are economical and scientifically sound, the possibility for expansion of the utility of blown plastics products, postwar, is very great.

PATENTS

PREPARATION OF FINE CELLULOSE FLOUR, 2,362,528, Emil H. Balz, Andrew W. Kassay, and William D. Williams, Toledo, O., assignors by mesne assignments to Libbey-Owens-Ford Glass Co., a corporation of Ohio. Serial No. 445,656. 2 claims. (Cl 83-94).

A method of producing cellulose flour that comprises grinding cellulose in a tumbling impact mill, air separating the fines from the resulting product, regrinding the tailings from the air separation in a rotor impact mill, air separating the fines from the material so ground, and returning to said tumbling impact mill the tailings from the second air separation.

DYEING VINYL POLYMERS, 2,362,375, 2,362,376, and 2,362,377, Karl Heymann, Meadville, Penn., assignor to American Viscose Corporation, Wilmington, Delaware, a corporation of Delaware. Serial No. 319,019, 322,843 and 322,845; 16 claims. (Cl 8-55).

Methods of dyeing yarns and other shapes comprising vinyl polymers, comprising the step of treating the yarn or shape with an aqueous dye bath containing a suspension dye-stuff, in the presence of various organic compounds.

INJECTION MOLDING APPARATUS, 2,362,469, Walter P. Cousino, Detroit, Mich., assignor to Chrysler Corporation, Highland Park, Mich., a corporation of Delaware. Serial No. 410,223. Drawing. 6 claims (Cl 18-30).

Apparatus for injecting plastic-like material comprising a hopper for such material, a nozzle having a discharge passage, a passageway communicatively connecting said nozzle discharge passage and said hopper, means for displacing said material from said hopper and forcing it through said nozzle discharge passage, mechanism for driving said displacing means, a valve for controlling the flow of plastic-like material through said nozzle discharge passage, a control for said driving mechanism, and means interconnecting said valve and said driving mechanism control so constructed and arranged as to shift the latter to render said driving mechanism operative and inoperative when said valve is opened and closed respectively.

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end should stop at no less than half of the pitch of the thread from the end. A minimum of $\frac{1}{32}$" is a good general practice for most thread sizes.

Shrinkage

Draft is not used on threads. Therefore all molded thread surfaces of the mold should be as smooth and highly polished as possible to afford easy removal of the molded part from the mold. The leverage or mechanical advantage gained with a screw thread during turning is sufficient to overcome the friction of removal along the common axis of the screw.

Caution must be taken to prevent over-polishing of screw threads on the mold. Over-polishing causes sunken areas or surface irregularities, which makes the molded part difficult to remove and at the same time produces a poor thread. Chromium plating of mold threads in order to obtain a high-gloss surface should usually be avoided because chromium plating, being a high-voltage process, causes much more chromium to deposit at the tips of the threads than in the root of the threads. This causes an improper thread contour resulting in a poor fit.

Shrinkage occurs on molded threads and must be compensated for in the mold making. These compensations need only be made on the diameter of the thread and on the lead. Diameter should always be compensated for on any thread, but the lead or pitch frequently is not corrected when short threads are involved provided the total shrinkage is very slight in comparison with the fit. Long threaded portions should always be corrected for lead, particularly if the part is to be mated with metal threads since the metal threads will have no shrinkage.

Phenolics, for example, shrink on the average of .007" per inch of length after leaving the mold. Acetates shrink about .003" per inch. Phenolics produce the stronger threads. If molded threads of like materials are to be mated, shrinkage on the lead is usually not corrected since both parts will shrink the same amount and will match perfectly with each other.

There are three methods in the tool room for compensating for lead which will be thoroughly discussed later. One of these methods may be accomplished with any standard lathe by using a special procedure.

Molded parts having external threads can usually be unscrewed from the mold very easily because the thread shrinks *away* from the ring that produces the threads. A molded internal thread, however, will shrink *tightly upon* the core if it is not unscrewed immediately after the mold is opened.

Pipe Threads

Pipe threads are tapered exactly $\frac{1}{16}$" per inch measured on the diameter. They release more easily from the mold due to this taper. The threads are very sharp instead of having as much width of flats at crest and root as screw threads. Pipe threads are used to *seal on the threads* by means of a wedging action set up as they are drawn tight. Therefore it is generally poor practice to allow a flash line along the threads with thermosetting materials, as a leakage will occur along the flash line. Thread rings should be used to mold these threads. Thermoplastics will yield more easily when tightened and the flash marks can usually (except with the harder materials) be flattened out for sealing.

The design of the leading end of the thread should be rounded for the same reasons as for screw threads. The root, which is nearly sharp, should not run completely to the back of the thread on a molded part if much strain or vibration is to be encountered. Chamfer the thread mouth in the thread ring of the mold to about 15° off centerline to remove the sharp corners at the end if maximum strength is required of the pipe thread.

It is very poor practice in plastics to use internal pipe threads due to the extreme wedging effect produced by the normal taper of a pipe thread which easily spreads or cracks the plastic unless the wall section around the thread is very thick. Wedging creates tensile stresses with internal threads and compressive stresses with external threads. Tensile strength is only about one-fourth as much as compressive strength in molded plastics.

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WHO'S WHO IN PLASTICS

The Society of Plastics Engineers have organized a Professional Activities Committee with John R. Mickey of the Ford Motor Company as national chairman. Subcommittee chairmen are: H. J. McGowan of Bakelite Corp., Chairman of the Molding Materials Committee; A. D'Agostino of Evans-Winter-Hebb, Inc., Chairman of the Molding Techniques Committee; Harry Kline of Reichold Chemicals, Inc., Chairman of the Laminating Committee; L. J. Morrison of Quanstrom Tool Co., Chairman of the Tool Design Committee; L. H. Wilson of Geo. W. Walker Co., Chairman of the Product Design Committee; Gunnar C. T. Lindh of the Udylite Corp., Chairman of the Consumer Specifications Committee; and Donald Rogers of Detroit Varnish Works, Chairman of the Coatings Committee.

Wm. B. Hoey, National President, Society of Plastics Engineers, represented SPE at the Baekeland Memorial Dinner of the Society of the Chemical Industry in New York City February 9th. George Scribner, SPI President, Wm. T. Cruse, Executive Vice President SPI, and W. S. Landis, President of PMMA (Plastics Materials Manufacturers' Association) officially represented their respective organizations.

Islyn Thomas, who resigned recently as general works manager of Ideal Plastics Corporation, has formed the Thomas Manufacturing Co. in Newark, N. J.

Whiting N. Shepard of the Plaskon Division of Libbey-Owens-Ford Glass Co., in a recent talk to the Plastic Club of the United States in New York City, predicted that a general purpose plastics material was within the bounds of reasonable possibility.

J. E. Thomas has been appointed manager of the Industrial Product Sales Division by B. F. Goodrich Co., Akron, Ohio. Mr. Thomas will direct the sales of adhesive materials.

(CONTINUED FROM PAGE 129)

Self-Tapping Screw Threads

Threads produced by self-tapping screws can provide very strong assemblies if done in the right way. The customary but inferior method is to drill a hole into the molded part and to screw any one of several types of self-tapping screws into the drilled hole. The threads are cut into the soft material and all types of screws but one will cause a wedging action as the tapping progresses. Weak threads result—threads that are easily stripped and sections around the tapped hole that are easily cracked when tightened.

The best results are accomplished with thermosetting materials by *molding* the hole for tapping instead of drilling the hole. This provides the "case hardness" characteristic of thermosetting materials which exists in the walls of the hole to be tapped so that the threads are cut into this hard surface instead of into soft material. Thermoplastics do not have this advantage and are soft all the way through. The type of self-tapping screw to use should be one with ample cut-away portion at the leading end to provide space for gathering the cuttings as the tapping progresses, and with the threads sufficiently far apart to allow sufficient plastics material between the threads to prevent stripping. The threads should not be tapered or gradually widened as the thread progresses or a wedging action will result. The screw should be constructed similar to a standard tap used for cutting metal threads as far as the thread shape is concerned, but only one groove is necessary. The thread should *cut* its way into the plastics part and not wedge its way in, except with thermoplastics.

Under proper conditions the threads can hold so tightly that the head can be twisted off the screw before the threads will strip.

Other Considerations

Usually it is not advisable to use threads smaller than 32 threads per inch in molded plastics. They are too easily stripped and the finer the threads the slower will be the removal of the part from the mold by unscrewing. Threaded metal inserts molded into the part are better.

When holes are drilled and tapped for screws the entrance of the hole should be chamfered before tapping to prevent chipping at the edges of the hole. The same applies to molded holes for tapping. Sharp corners chip very easily during tapping. The chamfer should be larger than the major diameter of the screw. A radius is nearly as good as a chamfer from the standpoint of tapping but is better for the core that molds the hole since it prevents stress concentrations.

Most of the above facts concerning tapping can be studied with transparent models to determine the amount of stresses established by various types of screws, chamfers, and hole sizes. Put a piece of polaroid glass on each side of the screw assembly and rotate one of the pieces of glass to study the strain lines. The closer the lines are together the higher the stresses in that region. Cast phenolics can be used for transparent models of thermosetting materials. This will exaggerate the effect of brittleness.

High impact materials have poor thread strength when the threads are machined. Molded threads are much better if the pieces of filler are small enough to fill out well into the threads. If the size of filler is large in proportion to the threads the filler usually will stop at the edges of the threads during molding and the resin will fill out into the threads. Such resin threads are weak and brittle.

The quality of machined threads varies considerably with different plastics materials. The soft thermoplastics tend to tear during machining and give a rough appearance.

Molded parts with many threaded portions may be made by using thread cores or thread rings that are removable from the mold and come out with the molded part as it is removed from the mold. These cores or rings may then be unscrewed from the molded part and placed back into the mold for the next molding operation.

The Prince series in TDJ ends with this article. The series will continue in "Industrial Plastics". The first issue will carry Mr. Prince's "Dimensional Control of Molded Plastics".

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MICHIGAN 7230

A New Gaging Method For Quality Control

by P. M. Dickerson
Lamp Division
WESTINGHOUSE ELECTRIC & MFG. CO.
Bloomfield, New Jersey

Ordinarily, inspection by means of go-no-go gages (method of attributes) has many drawbacks. Attributes inspection does not reveal trends or slow changes in the manufacturing process which might, if allowed to continue, result in the production of scrap. Actual measurement of the manufactured product (variables inspection), of course, would reveal such trends and make it possible to prevent defects.

Also the use of go-no-go gages does not enable the manufacturer to find the distribution of the product for the dimension inspected. In other words, if all parts pass the go-no-go gages, the parts measured may be just inside either tolerance limit and further use of the tool would result in defective production. You all are familiar with the effect of tool wear displacing the bell shaped distribution curve toward the specification limits. If the distribution of any single hour's production is just barely within specification the manufacturer should wish to know of his precarious position.

Normally, only control charts in the form of fraction defective charts can be used with attributes inspection. However, defective charts are quite insensitive. If you deal in thousands of parts, 1 percent defectives is a large number numerically. A purchaser using a fraction defective chart could determine the quality of a lot of material already produced. The manufacturer, however, usually does not find it economical to base his controls upon defects already produced. He would prefer to detect trends and know distributions in order to prevent the manufacture of defects.

Thus, considering the above difficulties, any means of detecting trends and distributions should be welcome indeed when the manufacturer is forced by circumstance to use attributes gages. Refer to the accompanying examples of charts used for this purpose. Example A shows a typical instance. Some gages, such as Micro-check gages, indicate size continuously but the only marks or figures on the scale are tolerance limit pointers set according to standard parts. The inspector can, with this type of gage, determine by the position of the moving pointer, with respect to the limit pointers, whether the parts are above the plus limit (+R), in the upper one third of the tolerance (L), in the middle one third of the tolerance (M), in the lower one third of the tolerance (S), or below the minus limit (−R). Where the distance between the set tolerance limits is too small to estimate three regions within the tolerance limits, the form showing R, L, S, −R only is used. In this case L is the upper half and S the lower half of the tolerance.

(TO PAGE 134—PLEASE)

CONTROL CHARTS BY ATTRIBUTES

EXAMPLE A

		NAME OF PART		DWG. No.		DATE		PIECES INSP.		MACH. No.			INSPECTOR		SHIFT		
DIMENSION	+R		xxx	*					xx	*				xx	*		
	L	xx	x	*			xx	xxx	xx	*			xxx	xx	*		
.250 ± .002	M	xx		*		xxxx	xx	x		*	xxx	xxxx	xxxx	x		*	xx	xxxx
	S			xx	xxx					xxxx	x				xxxx	xx	
	−R			xx													
	+R																
	L	xxx	xxx			x							xxx	xxx	xxx	xx	
.632 ± .001	S			xxx	xxx	xx	xxx	xxx	xxx	xxx	xxx	x	*			x	xxx	xxx
	−R											xx	*					
	SAMPLE	8:00AM	9:00AM	10:00AM	11:00AM	12:00	1:00PM	2:00PM	3:00PM	4:00PM	5:00PM	6:00PM	7:00PM	8:00PM	9:00PM	10:00PM	11:00PM	12:00

*Tool Changed.

EXAMPLE B

| | SAMPLE No. (RECORD TIME) | | | | | | | | | | | | | | | |

A Production "Believe It Or Not"

The mass production of parts for the Army, Navy and Air Forces with their demanding specifications has been both a challenge and opportunity for American industry. It was a challenge in that much closer tolerances for high production parts were required than many manufacturing plants ever met

before. There was some understandable reluctance on the part of some plants to accept such work. It was an opportunity in that new standard procedures could be set up from scratch. The unprecedented interchange of both tooling and methods "know-how" paved the way for shops and plants to accept contracts and turn out work that would not have been possible otherwise.

The fact that industry achieved precision mass production with an overwhelming percentage of unskilled workers is, in any perspective, remarkable. One of the secrets is tooling that made automatic high accuracy practical under these conditions.

The Young Precision Mandrel is representative of this tooling development. These mandrels are self contained, self expanding and self locking. They are built to the tolerance limits of work bore diameters. Concentricity is maintained in low tenths with absolutely uniform full work length friction locking combined with complete control and contact of the entire bore surface area. This makes possible the continuous placement of parts on the machine in successively exact duplication of positioning.

It may be said that automatic high accuracy means concentricity in low tenths with neither additional time nor cost involved. Such accuracy is a safety factor that more than absorbs an operator's margin of error. Scrap and salvage operations are also reduced.

The Young Precision Mandrels, by eliminating "C" washers, wrenches and drawbars, save yearly maintenance cost plus daily air or oil supply cost per machine, reduce down time and external operating motion time. Young Arbor Co., 3257 Bradford Rd., Cleveland Hts. 18, O.
INFORM-A-GRAM KEY No. B52-W

★

New Gaging Method

(CONTINUED FROM PAGE 132)

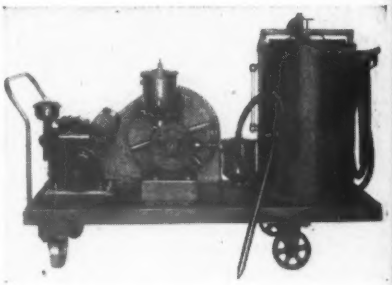
If go-no-go ring or plug gages must be used, refer either to the .632" ±.001" section of Example A or to Example B. This method presupposes some previous training of inspectors so they will know when a sample part fits tight on a go plug gage or loose enough so that it will almost fit on the no-go plug gage.

Extensive information cannot be obtained from this kind of chart. As mentioned earlier, variables control charts should not be replaced by this type of chart. The best use of the charts shown here is in a situation where some attributes gages are in use and cannot be replaced easily with variables measurement. The information obtainable from these charts can be seen in the examples A and B. Where three divisions are used, the trend of tool wear can easily be observed as the hourly samples change gradually from −R to S to M to L and to +R. However, if only two divisions (L and S) are used the changes naturally seem more sudden. When using these charts you will be able to control quality much better than with go-no-go gages used in the usual manner.

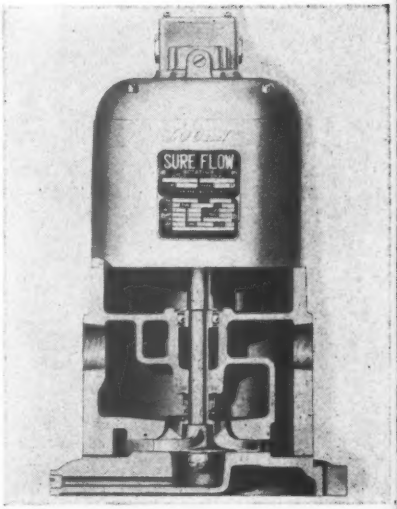
These charts have been found helpful in the manufacture of complicated parts. Certain dimensions were easily measured by means of a dial gage or micrometer but others could be inspected on a production basis with special gages only. It was on gages such as this that some of the advantages of variables inspection were obtained from attributes gages. The trial has been very satisfactory. Although very little scrap was being made, a considerable amount of reworking was necessary. The machinists, not knowing exactly where they stood regarding the tolerances (only go-no-go information), were inclined to aim for the high side of the tolerance. If they then made an error they merely reworked the part. Patrol inspection plus control charts have reduced the rework from 10 percent to less than 1 percent.

PROGRESS ON PARADE

A NEW SUCTION UNIT, for removing the liquid residue in a metal or wood container after it has been cleaned out, is now manufactured by LEIMAN BROS., Dept. T, 141-79 Christie St., Newark 5, N. J. The outfit consists of a powerful rotary vacuum pump especially designed to create not only a high degree of vacuum, but a sufficient volume of air to provide the necessary power to remove the liquid. The vacuum pump is powered by either an electric motor or gasoline engine and the combination is mounted as a mobile unit, ready for operation with the rubber hose and special suction tool. The tank which catches and holds the residue is equipped with a glass gauge indicating the accumulated amount of liquid. The vacuum pump is automatically lubricated and there is a relief valve to regulate the degree of vacuum to be used. This new unit is made in sizes for cleaning one, two or more barrels or containers at one time. Leiman Bros. will send full information on request.
INFORM-A-GRAM KEY No. 362-W

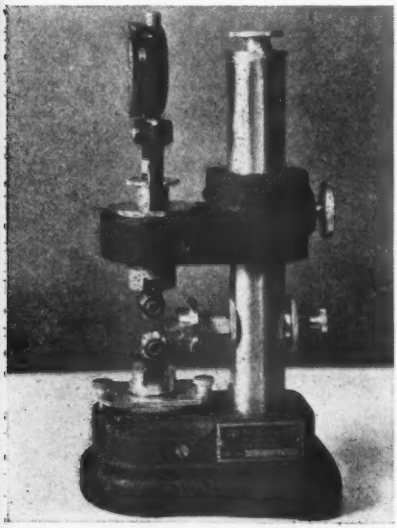


CENTRIFUGAL COOLANT PUMPS. Although designed for pumping coolants and cutting oils, the new centrifugal pumps announced by Logansport Machine Co. are adaptable for circulating cooling liquids, pumping or circulating water or quenching oil and general liquid transfer service. These Logan Sure-Flow Pumps are available in foot mounted, bracket mounted, flange mounted, grinder and submerged types.* The open impeller feature on the Logan Pumps eliminates the need for close clearances or metal-to-metal contact of running parts and thus allows pumping of liquids containing some abrasives, filings and other foreign matter, without damage to the pump. Greater latitudes in locating the pump are provided by an integral motor drive and the self-priming without submerging



feature (found on the base and bracket mounted models) affords extreme latitude in locating the pump in relation to the liquid to be pumped. The ball bearing type motor is totally enclosed, thus protecting it against splashing liquid and abrasive dust. Since the maximum power is consumed at zero pressure, Logan Pumps cannot be overloaded and any increase in static head, friction head or back pressure reduces delivery and power requirements. Rabbeted mounting of the motor housing assures permanent alignment of pump and motor. For more information on Sure-Flow Pumps, write LOGANSPORT MACHINE CO., Dept. J, Logansport, Ind.
INFORM-A-GRAM KEY No. 372-W

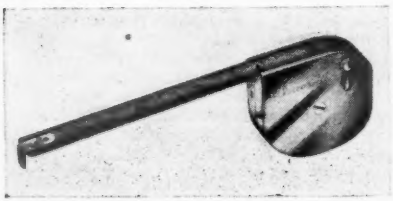
UTILITY GAGE. The prominent use of threaded parts brought about by the wartime demand for close tolerances and the consequent rigid inspection of parts has resulted in the production of the Utility Gage. This instrument is manufactured by UTILITY GAGE CO., 813 Clark Ave., St. Louis 2, Mo. Although all dimensional points of this gage are adjustable, the adjustment is most rapid and accurate since the setup conforms exactly to the dimensions of the master part. The entire operation for checking a threaded part in the Utility Gage consists of a short lateral movement through the rolls and up against a backstop, reading the dial indicator while in this position, withdrawal of the piece and placement in the "accepted" or "rejected" allocation. To be effective, this type of unit must be easily set to any given thread piece within its capacities. Roll adjustment can be readily made to .00025". While the Utility Gage is primarily designed to check threaded male parts, it may also be used to check any dimension of any shaped part within its physical range. Write the company for more detailed information.
INFORM-A-GRAM KEY No. C96-W



MACHINE TOOL CABINET-BENCH. The heavy steel top featured on the machine tool cabinet-bench manufactured by LYON METAL PRODUCTS, INC., Dept. DJ, Aurora, Ill., makes a sturdy mounting for small grinders and vises. The bottom shelf and adjustable center

shelf furnish 12 square feet of storage space. This machine tool cabinet-bench is available in two models. Model No. 2345-11 is 36" wide, 24" deep, 34" high with the bottom shelf 7½" above the floor. Model No. 2345-12 is the same cabinet with a built-in flat key lock. The cabinet is finished in green baked enamel and is shipped set up. Additional data and prices will be sent by the company on request.
INFORM-A-GRAM KEY No. B7-W

STEEL TAPE RULE. A redesigned "Streamline" Rule has recently been announced by the Master Rule Manufacturing Co. The tip of the rule has been made longer ($\frac{1}{16}$"), giving a hook which enables the user to operate the Master with one hand and to make measurements beyond arm's reach without any slipping or jumping of the rule during the measurement. The longer tip also makes it possible to caliper any round object up to nearly an inch in diameter. The braking surface for the lever lock is now as wide as the blade itself and twice as long as formerly, thus holding the blade absolutely immovable with much less finger pressure. By putting the lever

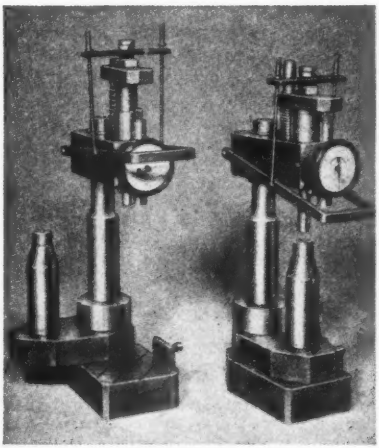


SUN DIAL INDICATOR GAGES

for . . .
DEPTH, LENGTH,
THICKNESS,
HEIGHT,
LOCATION,
and *Special*
Measurements

DEPTH GAGE

HIGH-SPEED • • ACCURATE • FOOL-PROOF • • DURABLE •



THICKNESS GAGE

This high-speed, durable, and accurate gage enables you to take readings of variations as small as .0001". Each individual depth and length dimension can be checked visually, and errors determined. No expensive or complicated measuring equipment is required either for checking or setting. A simple master setting gage supplied with each SUN DIAL INDICATOR GAGE provides a quick and dependable method of setting and checking.

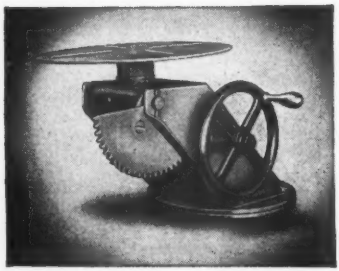
These instruments are being used in inspection rooms and on production lines by ordnance manufacturers working for the U. S. Army, Navy and Air Force.

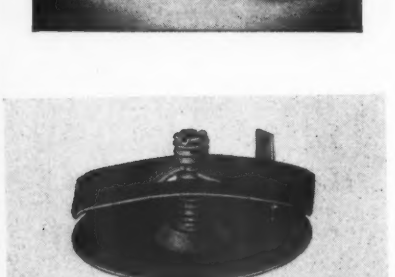
Descriptive folder will be sent you on request—no obligation.

SUN TOOL AND GAUGE CORPORATION
380 Canal Street · New York City

lock at the back edge of the case, it is possible to take an inside measurement and retain the reading in the same motion. Readings are identical from every angle. An illustrated circular on the "Streamline" Rule can be obtained from MASTER RULE MANUFACTURING CO., INC., Dept. D, 815 East 136 St., New York 54, N. Y.

INFORM-A-GRAM KEY No. C95-W





NEW ARO DRILLS. The new line of drills announced by The Aro Equipment Corp. is manufactured with a one-piece aluminum housing and can be equipped with $\frac{3}{16}$", ¼" or $\frac{5}{16}$" Jacobs Chucks. Model 109, as shown, and Model 1010 operate at 2500 rpm while Models 1013 and 1014, used for aircraft work and jobs requiring high speed and sustained torque, operate at 4000 rpm. Important features include: built-in oilers; 4-bladed rotors; hardened and ground cylinders; four ball bearing construction; gears and gear cages precision cut and ground for perfect alignment, reducing gear wear to a minimum; and are easy to assemble and disassemble. Standard equipment includes $\frac{3}{16}$" or ¼" Jacobs Chuck and 8' of ¼" hose and fittings. Write THE ARO EQUIPMENT CORP., Dept. TD, Bryan, O., for details.

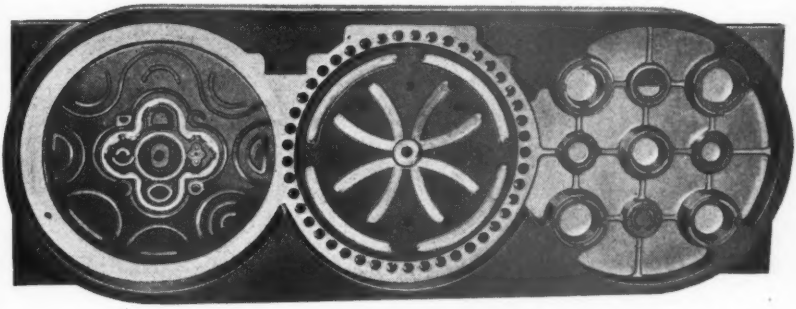
INFORM-A-GRAM KEY No. 195-W

THE HAND-OPERATED POSITIONER manufactured by Ransome Machinery Co. was designed to handle small units, thereby facilitating production and repair welding, assembly, overhauling, grinding, drilling, hard-surfacing and similar operations. It is this ability to handle small work that makes the Model 1H a versatile machine for welding, assembly, maintenance and repair shops. This Ransome Positioner has a tilting range of 150°, revolves 360° and can be locked in position at any degree of tilt. Its capacity is 100 lbs., with the center of gravity three inches above the table. The 16" table top is equipped with $\frac{5}{16}$" slots. A swivel base is available if desired. Ransome Machinery Company now manufactures welding and work positions from 100 lb. capacity hand-operated to 40,000 lb. motor-operated; also turning rolls and other special positioning equipment. Address the RANSOME MACHINERY CO., Subsidiary of Worthington Pump and Machinery Corp., 1469 South Second St., Dept. TD-3, Dunellen, N. J., for further information.

INFORM-A-GRAM KEY No. 437-W

COVER PLATES. Although originally designed for patching bullet holes in airplanes, Speed Nut Cover Plates are now used industrially as removable covers for inspection doors, access holes and vent holes; also to seal holes left after alterations or removal of equipment. They are attached from one side by sliding one end of the Speed Nut into the hole, centering the cover plate over the hole and tightening the screw. The turned-down tab on the cover plate prevents the Speed Nut from turning while the screw is tightened. It can be removed by loosening the screw and slipping the Speed Nut out of the hole. They are made of SAE 1060 steel, heat treated, Parkerized and coated with zinc chromate primer; and are available in three sizes to fit a wide range of panel thicknesses and

FORTY-SIX OPERATIONS ONE WORK SET-UP

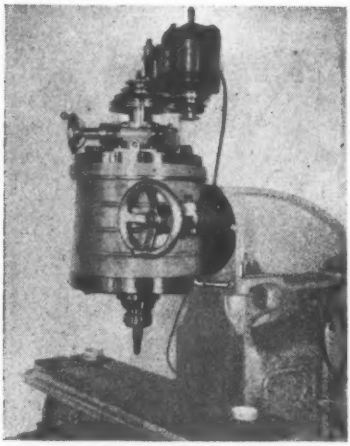


Size: 21" x 7". Time: 6 hours, including layout.

Matthew Rotary Tool Carrier

●Most vertical milling machines and attachments have fixed spindles which usually require a rotary table and a new, time consuming set-up for each operation. ●The Matthew Rotary Tool Carrier is movable either in a fast, direct manner or by worm and wheel so that a job can be completed with a single set-up. For straight line cutting, however, the cutter spindle can be solidly locked, the lock going around the full diameter of the outer body. ●Work is first scribed out. After each operation, the cutter spindle is quickly returned to dead center, checked by means of a spindle lock. It is then reset for the next operation. ●Positive, fool-proof, the Matthew Rotary Tool Carrier saves precious time on every job while maintaining the highest standards of precision. ●Recommended especially for fast, economical, precision machining of Plastics Molds; Metalworking, Die Casting and Forging Dies and Metal Patterns. *Descriptive Circular on request.*

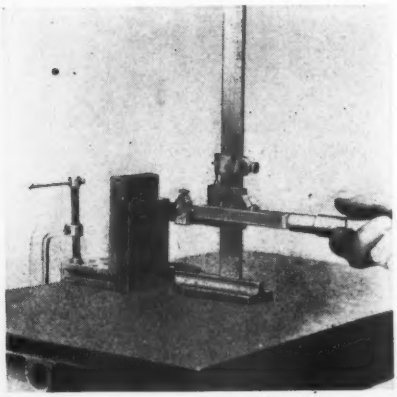
PRODUCTION MACHINERY DEVELOPMENT COMPANY
4849 St. Aubin Avenue, Detroit 7, Michigan



FITS ANY HORIZONTAL MILLING MACHINE

Circular Capacity—7 inch diameter.
Tool Capacity in Steel—1 inch end mill.
Spindle Speeds—600 to 2800 R. P. M.

to cover holes of 29/32", 1⅛" and 1⅜" diameters. Speed Nut Cover Plates are manufactured by TINNERMAN PRODUCTS, INC., 2095 Fulton Rd., Cleveland 13, O. More information will be sent on request.
INFORM-A-GRAM KEY No. 76-W



HYDRAULIC FOOT PUMP. A two-speed foot pump for pressures up to 10,000 lbs psi has recently been added to the Lyon-Raymond Corporation's line of hydraulic pumps. It is equipped with two pistons—a high speed, low pressure and a small, slow speed, high pressure piston—which make possible the automatic change speed feature. Up to 1000 lbs pressure, both pistons pump oil; but at 1000 lbs the high speed, low pressure piston automatically cuts out and the higher pressures (up to 10,000 lbs) are developed by the small, high pressure piston. This pump is particularly useful for the many applications which require, first of all, that a volume of oil be delivered and, secondly, that high pressures be developed. Maximum pressure can be pre-determined by the adjustment of a relief valve. The pump is self-contained, designed for continuous, heavy duty performance and can be furnished with a base suitable for mounting or with an auxiliary base for allowing it to be used on the floor without fastening. Additional information on this new hydraulic pump will be sent by LYON-RAYMOND CORP., Dept. J-2, Greene, N. Y.
INFORM-A-GRAM KEY No. 374-W

NEW POWER BRUSH. The Monitor Brush No. 1409-S-22 is a new power brush announced by Osborn Manufacturing Co., for removing burrs, preparing metal surfaces, working on rubber parts and many other applications. It is a 12" monitor section filled with .005" power brush wire and has a 1¼" arbor hole. Because of the uniform cutting maintained throughout the life of the brush, it is especially suited to aluminum, brass and other ductile metals for removing burrs without damaging adjacent surfaces. It is for this reason also that it is applicable to rubber parts and similar jobs where there is considerable resistance to the fill-wire. Test reports indicate that the brush has a cutting rate four times as great and a brushing life three times longer than the fine-wire brushes heretofore manufactured. Complete details and analyses of successful applications of the new brush may be obtained by writing THE OSBORN MANUFACTURING CO., 5405 Hamilton Ave., Cleveland, O.
INFORM-A-GRAM KEY No. 417-W

LAYOUT SET. Somerset Tool Co. is the manufacturer of a layout set with scriber and punch holder for use with a height gage. The complete set includes an automatic height gage tapper, a center test, a high speed scriber, a punch with insert, two extra inserts and directions for layout. The scratch as drawn across the material is of 60° included angle, 30° on each side with the center or apex in line with the scriber supporting surface. The prick mark is made by a 60° center punch inserted in the holder and the conical point of the center punch is exactly in

DIECASTING DIGEST

VI—More Production of Better Castings by Electric Cycle Control

Maximum production of uniformly satisfactory die castings is possible only when the human element is eliminated. Manual control of each casting cycle is obviously subject to every whim and variation of human nature. A human being simply can't make a time clock of himself, hour after hour, day after day. The modern, efficient way to meet present labor conditions is to eliminate the human element by complete cycle control through electric time clocks.

Cycle timing of Lester-Phoenix machines is accomplished by three electric time clocks, controlling (through solenoid actuated oil hydraulic valves) closing of the die, injection of hot metal *after* the die is closed, application of high injection pressure on the metal as it chills during the selected "dwell" period, die opening and hydraulic ejection of the finished casting, then exact repetition of the pre-selected casting cycle. Ejection, by the automatic hydraulic ejector after die is fully opened, is soft and easy with no injury from ejector pins, since casting has had maximum time to solidify.

★

Get This Bulletin

Send for new catalog on HHP-1 (zinc) and HHP-1 CC (aluminum) — Lester-Phoenix, Inc., 2625 Church Avenue, Cleveland 13, Ohio.

This Machine's "Brain" Helps You Make BETTER DIE CASTINGS AT HIGHER SPEED AND LOWER COST

Completely automatic electric control system—the "brain" of the Lester-Phoenix.

The Lester-Phoenix HHP-1CC die casting machine for aluminum, brass and magnesium castings.

Exact control of the complete die casting cycle to the tenth of a second—with exact repetition of die movement, injection, core pulling and ejection by means of electric timers—produces the maximum of uniformly good castings at lower cost even with today's labor.

WRITE NOW

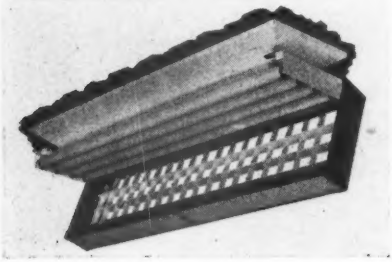
for data on the new high-speed Lester-Phoenix die casting machines, HHP-1 for zinc and HPH-1CC for aluminum.

LESTER-PHOENIX, INC.
2625 Church Ave., Cleveland 13, Ohio

LESTER-PHOENIX
DIE CASTING MACHINES

line with the base of the punch holder. Illustrated is a center punch locked in a vee and being tapped with the automatic height gage tapper. A center test, using test indicator and gage blocks, is used for checking the vee scratch and the prick mark. Descriptive circular will be sent by SOMERSET INDUSTRIAL DIAMOND CO., 200 Virginia St., Hillside, N. J.
INFORM-A-GRAM KEY No. 614-W

THE E-Z SERVICER fluorescent lighting fixture has been designed to eliminate the maintenance inconvenience characteristic of conventional fixtures. It can be opened by one man without the use of tools for cleaning or changing tubes. The E-Z Servicer fixture is made in four models, including both the



ribbed glass glare shield and the louvered types, industrial and commercial designs with 2, 3 and 4 tubes and starter or instant type ballast. It can be installed in either single ceiling fixtures or in continuous runs. The E-Z Servicer is a product of R. & W. WILEY, INC., Dept. TJ, Dearborn and Bridge Sts., Buffalo 7, N. Y. More information is available.
INFORM-A-GRAM KEY No. C93-W

UTILITY KIT. The Abrasive Co. of Philadelphia has combined 20 carefully selected mounted points with an Electrolon dressing stick 5" x ½" x ½" into a useful and convenient Utility Kit. The points are mounted on stainless steel mandrels 1½" long and ⅛" in diameter and may be used on high speed grinders of either air, electric or flexible shaft drive. The Electrolon (Silicon Carbide) dressing stick is included for dressing and altering wheel shapes for special applications. In addition to industrial uses, owners of home workshops and many small shops will find this kit a valuable addition to their grinding equipment. ABRASIVE CO., Div. of Simonds Saw and Steel Co., Dept. J, Tacony and Fraley Sts., Philadelphia 37, Pa., will send literature describing the Utility Kit MP-21.
INFORM-A-GRAM KEY No. 172-W

A RADIUS BRAKE has been designed and developed by the O'Neil-Irwin Manufacturing Co. at the request of aircraft manufacturers requiring a precision machine capable of properly forming duraluminum, chrome molybdenum, rust resistant and spring tempered alloys and various other low ductile materials essential in the fabrication and production of aircraft. Case hardened and spring tempered materials that must be formed after heat treating can also be worked to accurate dimensions. Accuracy to a tolerance of .001" in all duplicated work is guaranteed. All working surfaces of the Radius Brake are adjustable in all planes and angles, making it possible to obtain a true radius over the entire material width at the point of forming regardless of angularity (within the capacity of the unit) on any bend or type of material being worked. The possibility of fracture or disintegration developing at the line of forming is eliminated by the Di-Acro Radius Brake. Adjustable stops hold the degree of angularity to die tolerances. Working surfaces are readily removable for changes or replacements and they are of cold rolled steel, properly hardened and heat treated to resist wear. A new 40-page catalog covering the Di-Acro Brake will be sent by O'NEIL-IRWIN MANUFACTURING CO., Dept. T, 315 Eighth Ave., S., Minneapolis, Minn.
INFORM-A-GRAM KEY No. 20-W

THE WOODWORTH

"CONE-LOK" JIG

The N. A. Woodworth Co. gives to industry *a new adjustable clamping jig* that possesses features that will increase *production* and reduce *production costs.* The new Woodworth "CONE-LOK" Jig utilizes the great braking power of perfectly mated male and female cones which assures instant locking effect so that the tray is positively clamped at any location whenever pressure in either direction is applied to the tray.

The Woodworth "CONE-LOK" Jig has only three actuating parts, is of rugged construction, and operates in an oil bath which promotes long service life.

The Woodworth "CONE-LOK" Jig is *safe, secure,* and *sure.*

N. A. Woodworth Co.
1300 E. 9 Mile Rd., Detroit 20, Mich.
Gentlemen: Forward my copy of the "Cone-Lok" Jig Catalog No. 45-J.

*Name*_____
*Title*_____
*Company*_____
*Address*_____
*City*_____ *Zone*____ *State*_____

ACCURACY YOU CAN TRUST

WOODWORTH

N. A. WOODWORTH CO., SALES DIVISION, 1300 E. NINE MILE ROAD · DETROIT 20, MICHIGAN

PRECISION GAGES · PRECISION MACHINED PARTS · PRECISION TOOLS

"Plastics Molds"

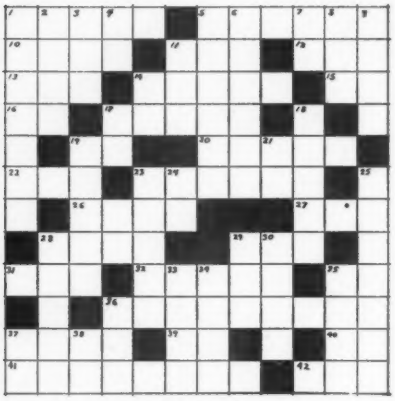
Enthusiastic response from technical editors and industrial men, to whom copies of Gordon B. Thayer's *Plastics Molds, Design—Construction—Use* were sent, has been followed by adoption of the book as a text in plastics classes in schools and universities. Unsolicited comments agree that the Second Edition is a considerable improvement over the first, because of its augmented contents. More designs are included, and more practical, useful information is furnished for the designer as well as the apprentice, mold shop operator, or the tool and die shop man who is interested in learning correct mold designing procedure.

Several of the 20 chapters were specially prepared by experts in the field, and the book thus gives the most authoritative and complete treatment of the design and construction of plastics molds now in print. Features new to the edition are chapters on "Finishing Methods and Equipment", "Loading the Injection Mold", "Direct, and Indirect, Ejector Systems for Injection Molds", "Molding Screw Threads in Plastics", and "Practical Points in Mold Design and Construction".

The book is available, at $3.50 postpaid, from American Industrial Publishers, 399 Fairmount-Cedar Building, Cleveland 6, Ohio.

Another TDJ Crossword:

(Solution will appear in April TDJ)



HORIZONTAL

1 Detroit washer die manufacturer
5 Cleveland designer and manufacturer of tools
10 Waltham manufacturer of comparators, gages and dial indicators
11 New York gage manufacturer (also a celestial body)
12 Aberdeen, S. D., tool grinder manufacturer
13 Floor pad
14 Kwik-Klamp toggle clamp manufacturer of Chicago
15 District Attorney (abbr.)
16 Mister (abbr.)
17 Method of duplicating written matter
19 Near
20 Work
22 Prefix meaning "new"
23 User of molds
26 Red horse
27 Inventor of cotton gin (first name)
28 Aviation corporation
29 Over (abbr.)
31 Fastener
32 An angle adaptor is made by this Los Angeles firm
35 To the same extent
36 Saginaw firm specializing in regrinding of tools
37 Electric motors are made by this Lima, Ohio, manufacturer
39 Suffix forming comparative degree
40 Neuter pronoun
41 High speed precision lathe manufacturer, Elmira, N. Y.
42 Office of Defense Transportation (abbr.)

VERTICAL

1 Kalamazoo machinery builders
2 Man's name
3 Veteran (abbr.)
4 Part of verb "to be"
5 Same as 5 horizontal
6 To take the load from
7 Elevated (abbr.)
8 Guided
9 Heavy inelastic metallic element
11 Man's name
14 Musical half-syllable
17 Belonging to me
18 Tool which bores
19 Same as 18 vertical
21 To exist
23 Famous battle of World War I
24 Upon
25 Cleveland maker of Bisco Tubing
28 Operatic heroine
29 Belonging to us
30 Long periods of time
33 Heat treat device
34 Ice floe
35 Opposite of alkaline
36 Unhappy
38 Same as 16 horizontal

FEDERAL

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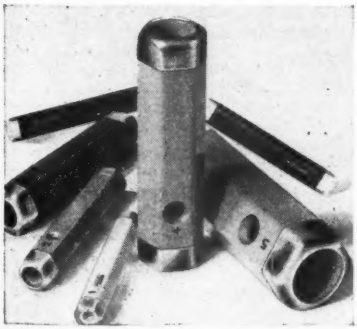
Made of durable plastic material, one-third lighter than aluminum. This lightness permits a most sensitive "touch" with less fatigue . . . an advantage appreciated by women inspectors.



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TWIST DRILL & TOOL CATALOG (15-A) containing 264 pages of drill and tool specifications with numerous illustrations has recently been published by the NATIONAL TWIST DRILL & TOOL CO., Dept. TD, Detroit, Mich. This catalog has been arranged in a convenient form utilizing colored pager to segregate carbon, high speed steel drills and reamers into separate sections. There are also separate sections covering high speed milling cutters, high speed steel hobs and an engineering data section covering data, tables and engineering information pertinent to the use of cutting tools and to the machining of metals.
INFORM-A-GRAM KEY No. C91-W

ELECTRODE HOLDERS are the subject of Bulletin 444 just published by the ALLISON TOOL & ENGINEERING CO., Dept. T, 4031 Whittier Blvd., Los Angeles 23, Cal. The Model "A" is a heavy-duty heat resistant plastic holder with a current carrying capacity of from 300 to 500 amperes. This fully insulated holder, consisting of only seven parts, may be laid, suspended or dropped on grounded surfaces without shorting. It has no springs to lose compression and no handles or gadgets to snag when dragged by the cable. The Model "B", built for light, high-speed production welding and which is particularly adaptable to aircraft and light sheet welding, is easy to handle in those awkward, hard-to-get-at spots.
INFORM-A-GRAM KEY No. 960-W

U-6 AUTOMATIC THREAD MILLER — This modern high speed precision machine for external and internal thread cutting is described in a 16-page illustrated Bulletin, No. 1044, issued by the UNIVERSAL ENGINEERING CORP., Dept. DJ, Cedar Rapids, Ia. Engineering drawings, cutaway views and views of various types of operations, tables of measurements and typical threaded parts made on the U-6 Automatic are shown. A few of the advantages of the U-6 Automatic include production of extremely accurate hobbed threads, internal or external threads, straight or taper threads of any standard or special thread form, of right or left hand. At the same time it is capable of close shoulder work.
INFORM-A-GRAM KEY No. B54-W

SWIVELIER WORK-LITES which can be easily attached to machines, work benches or walls are illustrated in Catalogs 108 and 109 available from RELIANCE DEVICES CO., INC., Dept. J, 30 Irving Pl., New York 3, N. Y. The removable glass lens protects bulb and inside of shade from oil and dirt. All Work-Lites are furnished complete with shade, socket, arm, base, oil resistant cord and handle cap.
INFORM-A-GRAM KEY No. 439-W

MOLTEN METAL PUMPS are described in a 4-page illustrated bulletin issued by the RUTHMAN MACHINERY CO., Dept. J, 1809 Reading Rd., Cincinnati 2, Ohio. These pumps, which speed up handling of molten metal, handle lead, babbitt, solder, zinc and other alloys at temperatures up to 1000° F. They have a capacity to deliver more than 1500 lbs of metal per minute to an elevation of six feet above the pot level of hot metal.
INFORM-A-GRAM KEY No. 318-W

WORM GEAR REDUCTION UNITS—A 4-page illustrated bulletin containing descriptions of the Speedaire Fan Cooled Worm Gear Reduction Units has been issued by the CLEVELAND WORM & GEAR CO., Dept. D, 3293 E. 80th St., Cleveland 4, Ohio. Comparative data on transmitted horsepower and installation costs is given.
INFORM-A-GRAM KEY No. 777-W

MARKING DEVICES are featured in a 4-page folder published by the MARQUETTE ENGRAVING & MFG. CO., Dept. T, 3421 Lincoln Ave., Chicago 13, Ill. Described and illustrated are die inserts, roller dies, special type and type holders, a special holder for embossing type, steel stamps, steel letters and figures. Also included are a group of standard steck symbols and symbols available in series. A size chart is shown to aid in selecting correct size symbols.
INFORM-A-GRAM KEY No. D18-W

POST-WAR PRODUCTION
will demand Precision Machining

NEW CATALOG NOW READY

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Illustrated in full color—showing all types and sizes of South Bend Lathes. Engine Lathes and Toolroom Lathes with 9", 10", 13", 14½", and 16" swing. Precision Turret Lathes with ½" and 1" collet capacity. Ask for Catalog No. 100-D.

Manufacturing costs must be kept within reason if you are to meet the keen competition that is sure to come with the post-war period. Then, if ever, you will need shop machinery that will operate with unquestionable precision. There will be no margin for loss of time, labor, and material resulting from the use of inaccurate, obsolete machines.

South Bend Lathes are designed and built to provide the extreme accuracy required for efficient production. Throughout the war they have been performing hundreds of essential war production operations with toolroom precision. Their war-time record stands as a recommendation worthy of careful consideration when peace-time plans are made. Substantial savings in capital investment, power consumption, floor space, and labor costs often result from their selection.

Today South Bend Lathes are better in every way. All of our facilities are still devoted to their manufacture. Improvements have been accelerated to meet war production needs. Their smooth, vibration-free operation at high speed permits finish turning and boring with such precision that subsequent grinding, honing, or lapping operations can often be eliminated.

SOUTH BEND LATHE WORKS

Lathe Builders For 38 Years

432 E. MADISON STREET **SOUTH BEND 22, INDIANA**

(CONTINUED FROM PAGE 146)

18 WAYS TO SAVE TIME & MONEY with the Mead Industrial Burring Machine is the title of a folder recently published by the MEAD SPECIALTIES CO., Dept. D, 4114 N. Knox Ave., Chicago 41, Ill. These machines are inexpensive and highly portable. Their utility ranges from snagging rough castings weighing up to several pounds to delicate finishing and polishing operations.
INFORM-A-GRAM KEY No. 569-W

HANDY SHOP RACK, designed to hold a maximum load while utilizing as little space as possible, is described in a folder issued by the WM. S. YOHE SUPPLY CO., Dept. J, 507 Gibbs Ave., Canton 4, Ohio, manufacturers of "The Handiest Rack in the Shop." These self-balancing racks are used in production plants for serving stock to automatics.
INFORM-A-GRAM KEY No. 667-W

RUBBER CUSHIONED ABRASIVE WHEELS made in a variety of sizes for de-burring, finishing and polishing operations are pictorially described in a 4-page folder published by the Brightboy Industrial Div. of the WELDON ROBERTS RUBBER CO., Dept. TD, Newark 7, N. J. Any worker can use Brightboy as no special training is necessary. Brightboy is also available as cylindrical plugs, blocks, hand tablets, rods and sticks. They are ready for immediate use in three grades—Standard, Fine-Tex and Tuff-Tex.
INFORM-A-GRAM KEY No. 668-W

MAC-IT SCREWS made of MAC-IT Special Alloy Steel are featured in Catalog 43 issued by the MAC-IT PARTS CO., Dept. TD, Lancaster, Pa. These screws are used almost universally on revolving or moving machine parts, where protruding screw heads would constitute an accident hazard. They are especially adaptable in modern machine design considerations for clearance, plane surfaces and "streamline" appearance.
INFORM-A-GRAM KEY No. C83-W

MOORE PRECISION JIG GRINDER — This newly developed tool room machine for grinding holes to size and correcting hole locations in hardened steel parts is described in an illustrated folder issued by the MOORE SPECIAL TOOL CO., INC., Dept. D, 740 Union Ave., Bridgeport, Conn. This Jig Grinder will grind cylindrical holes or tapered holes up to 1½° on each side or 3° included angle.
INFORM-A-GRAM KEY No. 589-W

GAGES & DIAL INDICATORS for direct, impersonal measuring, size control and general inspection are pictorially described in Catalog 52 issued by the B. C. AMES CO., Dept. TDJ, Waltham, Mass. These dial indicators are available in four sizes and 14 different dial faces calibrated in increments as fine as .0001". Ames Hundred Series Indicators are offered with shock-absorbing wheel assemblies which enable indicators to take more blows at the spindle end, withstand more general rough treatment and retain their original setting and smooth action longer.
INFORM-A-GRAM KEY No. 189-W

ACRO TOOLS & FIXTURES are presented in several bulletins issued by ACRO TOOL & DIE WORKS, Dept. T, 4892 N. Clark St., Chicago 40, Ill. The Acro Chassis Cradle which speeds assembly, inspection, testing, aligning, repairing and other operations has proved of value in the radio and electronic industries and other fields of manufacture. Acro Needle Eye Laps for small holes are available in seventeen sizes. Acrolite Work Illuminators and Inspection Units are equipped with fluorescent bulbs that give a soft, glareless light without heat or shadows.
INFORM-A-GRAM KEY No. 595-W

BELLOWS PHOTO FACTS FILE containing twenty-five 8" x 10" photo-reproductions of installations of Bellows equipment in plants all over the country is available from the BELLOWS CO., Dept. J, 861 Tallmadge Ave., Akron 10, Ohio. Each illustration carries an interesting story of how the ingenuity of the company's tool engineers has solved a difficult production problem. On the reverse side of each pictorial case history the complete story of the specific application is given together with the cost of the Bellows equipment used. The Bellows CV-40 Automatic Vise Mounting was designed to permit a "double run" of the work piece, in which two holes are accurately located and drilled in the first run, and then tapped in the second run.
INFORM-A-GRAM KEY No. 839-W

PUNCH & DIE STEELS are described in several bulletins published by LATROBE ELECTRIC STEEL CO., Dept. TD, Latrobe, Pa. Mangano and Mangano Special are oil hardening non-deforming die steels and are particularly desirable for any uses where grinding after hardening and tempering is not permitted. GSN, a high chrome, low nickel tool steel with a carbon content of about 2.10%, is recommended for cutting and forming dies, cold forming, drawing, thread rolling, coining dies, shearing and slitting cutters. LPD is a molybdenum-tungsten hot work die steel which retains ample hardness at elevated temperatures and is highly resistant to the formation of heat cracks.
INFORM-A-GRAM KEY No. B67-W

TOOL TIPS is the title of an interesting booklet (Vol. 19, No. 4) published by the EXCELL-O CORP., Dept. D, 1200 Oakman Blvd., Detroit 6, Mich. Illustrated is a set of two carbide tipped spherical doming blades used to rough and finish form the concave combustion chamber in aluminum alloy aircraft cylinder heads. Ex-Cell-O Precision Way Machines, also described, for multi-purpose precision operations on metal parts can be designed with

Two left-hand flutes spiralling counter to right-hand flute simultaneously, shear mirror-smooth finishes in any machinable metal or plastic. ½" to 3 3/16" sizes. Extensions and follow-pilots of different lengths available for line reaming jobs. 500% greater expansion range enables 6 to ream as many different size holes as 30 conventional style reamers. Blades economically resharpened 8 to 10 times. Takes only 30 seconds to insert new blades. Reams smoothly over keyways, oil grooves, etc. Several important patented features. Good delivery. Ceiling-priced. Send for detailed literature.

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a specially constructed bolted center section. This method of bolted construction links the wing sections of the machine carrying the spindles, and the center pad section carrying the work fixture.
INFORM-A-GRAM KEY No. 737-W

EXTERNAL INDICATING GAUGES, for use with Metricator instruments, and which can be used successfully by unskilled operators are featured in a 4-page bulletin released by METRICAL LABORATORIES, INC., Dept. T, 410 Detroit St., Ann Arbor, Mich. No setting and constant re-checking of the gauges are necessary since they are set for a certain reading before they leave the plant. Their chromium plated indicating rings may wear from .0005" to .001" without affecting the accuracy of the measurements.
INFORM-A-GRAM KEY No. 884-W

PRECISION-BORE GLASS TUBES, produced in cylindrical, tapered, or square form and made of Pyrex brand glass or, if a softer glass is preferred, of Kimble NC glass, are described in Bulletin PB 293 available from the FISH-SCHURMAN CORP., Dept. J, 230 E. 45 St., New York 17, N. Y. These FS Precision-Bore Glass Tubes are used for graduated tubes where the capacity is equal for each unit of length; cylinders for syringes, pumps, bearings, etc., where a plunger must fit tightly and where interchangeable barrels are advantageous; for viscosimeters; manometers and barometers; burettes and colorimeters; tapered tubes for flowmeters and many other technical and industrial purposes.
INFORM-A-GRAM KEY No. 761-W

GLOBE MILLER—This unit makes a milling machine out of a standard lathe in three minutes as outlined in an illustrated folder issued by GLOBE PRODUCTS MFG. CO., Dept. T, 3380 Robertson Blvd., Los Angeles 34, Cal. The Globe Miller, which increases the swing of the lathe, gives an 11" lathe a 19½" swing. Photographs and descriptions of available accessories for this miller are included along with a list of installation instructions.
INFORM-A-GRAM KEY No. 305-W

INTERNAL CUTTING TOOLS made of super-high-speed steel are featured in Catalog 1139 published by BOKUM TOOL CO., Dept. T, 14775 Wildemere Ave., Detroit, Mich. Style A plain boring tools are particularly applicable on lathes. Style B facing and bottoming tools are employed specially for machining blind holes, as they make it possible to machine the bore and face the bottom in the same operation. Style C internal thread tools are designed for cutting a wide range of different threads.
INFORM-A-GRAM KEY No. A43-W

DIE SETS & DIE MAKERS' SUPPLIES are featured in the sixth edition of the DETROIT DIE SET CORPORATION'S catalog. Information on special die sets, toggle clamps, steel punch shanks, bushings, leader, dowel and shoulder pins, and socket head stripper bolts are included. Their flat rounded springs are designed to meet the requirements of the modern tool and die shop, the stamping and all sheet metal working plants. Numerous diagrams and specification tables are given. Use our handy Inform-A-Gram Key Number or address the company at Dept. TJ, 2895 W. Grand Blvd., Detroit 2, Mich.
INFORM-A-GRAM KEY No. 674-W

KWIK-KLAMP TOGGLE CLAMPS, designed for rapid clamping applications, are illustrated in a 16-page catalog available from DANLY MACHINE SPECIALTIES, INC., Dept. DJ, 2100 S. 52nd Ave., Chicago 50, Ill. The clamp linkage has been engineered to give the maximum open clearance to facilitate the removal of parts from the fixture, reducing the effort required by the operator, and resulting in increased production. They are desirable for holding parts in proper position for assembly work, light machining operations and metal and plastic stamping.
INFORM-A-GRAM KEY No. A56-W

COMPLETE TOOL ENGINEERING is a folder prepared by the McKINNEY TOOL & MFG. CO., Dept. T, 1688 Arabella Rd., Cleveland 12, Ohio, designers and builders of tools, jigs, fixtures, dies, gages and special machinery. McKinney maintains an engineering service including process engineering, product design, plant layout and routing and experimental and development engineering. This folder describes in detail the plant facilities and equipment of this company with which they serve industry.
INFORM-A-GRAM KEY No. 957-W

HEAT TREATING MATERIALS and chemical specialties intended for industrial use are presented in an informative 36-page booklet published by the PARK CHEMICAL CO., Dept. T, 8074 Military Ave., Detroit 4, Mich. The salt bath method is now generally recognized as the ideal way to harden all types of high speed steels, including the 18-4-1, molybdenum, molybdenum-tungsten, and cobalt types. Large numbers of tools may be safely hardened in a comparatively short time with a high speed salt bath set-up.
INFORM-A-GRAM KEY No. 756-W

DRILL JIGS & FIXTURE LOCKS are described in a 32-page illustrated catalog prepared by Siewek Tool Div. of DOMESTIC INDUSTRIES, INC., Dept. TD, Detroit, Mich. This catalog, No. 5A, contains blueprints and tabulated dimensions for various type spring jigs, rack and pinions, three post type jigs, four post type jigs, fixture locks and bushing plates.
INFORM-A-GRAM KEY No. C90-W

DETAIL ENGINEERS'-GLASS (Graph-Type) made for all standard optical comparator magnifications is illustrated in a colorful 8-page folder issued by the Engineers Specialties Div.

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8 mm. movie camera case profiled in large quantities

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Feed—Manual.
Production—30 per hour.
Previous Method—15 per hour.

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Investigate the possibilities of the Gorton Duplicator as the practical, economical solution to your high production profiling problems. Gorton engineers who have specialized for 50 years in the development of tracer-controlled milling will give you their recommendations without obligation. Submit part, prints or specifications to your Gorton dealer, or Factory at Racine, Wis.

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From 2 oz. to 2 ton DIE BLOCKS

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of the UNIVERSAL ENGRAVING & COLORPLATE CO., INC., Dept. TD, 980 Ellicott St., Buffalo 8, N. Y. Erasures can be made and yet the blue lines will remain undimmed on their Translucent Engineers'-Glass. Engineers'-Glass, Scribing, is for use in making Comparator Charts by scribing rather than by drawing.
INFORM-A-GRAM KEY No. 74-W

"POWER-GRIP" MAGNETIZING—A method of holding which goes beyond the limitations of older style magnetic chucks, providing flexibility and adaptability that are not possible to obtain in the other types, is presented in a descriptive booklet issued by ROCKFORD MAGNETIC PRODUCTS CO., Dept. J, 1022 6th Ave., Rockford, Ill. The principle of "Power-Grip" magnetizing develops intense holding power and results in locking magnetically the work, the chuck and the parallel.
INFORM-A-GRAM KEY No. A87-W

PHOTOSWITCH DENSITOMETER Series D90, generally used for making comparative measurements, accuratey measures the optical density of liquids, gases, films, filters, plastics and similar transparent materials. Developed for the control of industrial processes, this photoelectric system maintains uniform density of materials in quantity production. These densitometers are built to meet individual production control requirements as the application of the system varies with the nature of the process to be controlled. Bulletin 316, published by PHOTOSWITCH, INC., Dept. TD, 77 Broadway, Cambridge 42, Mass., gives detailed descriptions and schematic layouts for a variety of applications.
INFORM-A-GRAM KEY No. D5-W

PRODUCTION DATA from the Houghton line is presented in a 26-page pocket size booklet, No. 15, published by E. F. HOUGHTON & CO., Dept. TD, 303 W. Lehigh Ave., Philadelphia 33, Pa. Factual information on metal working, heat treating, machining and rust prevention is given. The contents include such subjects as the causes and cures of distortion, quenching steel castings, fighting fire with fog, mass production blackening of carbine magazines, making the world's smallest ball bearings and planning now for storage of war machines.
INFORM-A-GRAM KEY No. 324-W

MASTER SETTING & CHECKING ROLLS for the accurate checking of micrometers and other precision measuring devices are featured in an illustrated folder issued by SAV-WAY INDUSTRIES, Dept. J, 4875 East 8-Mile Rd., Detroit 13, Mich. These checking rolls provide for twenty quick, accurate checks covering the complete range of the micrometer. They are hardened, ground and lapped to X gage tolerance, and freeze treated before finish grinding to relieve internal strains and to provide accelerated aging. The set is housed in a modern transparent plastic case.
INFORM-A-GRAM KEY No. 16-W

BESLY-TITAN ABRASIVE WHEELS are described in a 46-page illustrated booklet published by CHARLES H. BESLY & CO., 118 N. Clinton St., Chicago 6, Ill. Straight holes or perforations are built into Besly Titan Perforated Steelbacs to provide clearance, thereby giving the ground particles an opportunity to escape. Whether used in connection with disc grinders or other types of machines, these Resinoid Bonded Steelbacs can be run either dry or wet.
INFORM-A-GRAM KEY No. 915-W

DIE CASTING MACHINES for lead, tin, zinc, brass, magnesium and aluminum alloys are described in a 16-page illustrated catalog published by the KUX MACHINE CO., Dept. T, 3924 W. Harrison St., Chicago 24, Ill. An automatic temperature control device which is recommended for every machine automatically adjusts the temperature for proper melting of the metal. This control aids in preventing damage to parts such as the gooseneck, plunger, nozzle and pot which are in contact with the molten metal.
INFORM-A-GRAM KEY No. 950-W

TABL-SPRAY METAL WASHING MACHINE, designed to meet the need for high-speed washing of flat, fragile work or circular parts with intricate pockets and crevices, is described in a recently revised Bulletin, No. 19, to incorporate new developments in the equipment of the AMERICAN FOUNDRY EQUIPMENT CO., Dept. J, 555 S. Byrkit St., Mishawaka, Ind. Operating sequences, mechanical features, construction specifications and details are fully covered. Schematic drawings and diagrams are included to illustrate the thorough spray cleaning action on the parts to be cleaned. Briefly described is their extensive metal cleaning laboratory which is equipped with practically every facility for scientific testing and analysis of metal cleaning problems.
INFORM-A-GRAM KEY No. 730-W

HOLO-KROME SOCKET SCREW PRODUCTS—A 48-page edition of their catalog No. 41 covers the entire range of socket screw products manufactured by the HOLO-KROME SCREW CORP., Dept. TJ, Hartford 10, Conn. Several illustrated pages are devoted to the design and physical characteristics of their "fibro forged" screws, which are completely cold forged. Photo-macrographs show the superior metallurgical fiber structure that results from this method of manufacture. The production, heat treating and physical testing of Holo-Krome Screws are most informatively detailed and illustrated as pertaining to socket set screws, socket head cap screws, socket head stripper bolts, socket pipe plugs, and socket screw keys. Detailed engineering data

Heat Treat Your Own Small Parts...

SAVE TIME AND MONEY THESE 5 DIFFERENT WAYS

This small compact electric furnace is inexpensive, handy and easy to operate—ideal for small tool and die shops—saves time these five different ways:

1. Eliminates delays in sending small machine parts out to overcrowded commercial heat treaters.
2. Saves time and expense of drawing or tempering small metal parts in large furnaces.
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4. Conveniently available for pre-heating for subsequent high-speed hardening.
5. Eliminates shut downs and delays in servicing emergency repair orders.

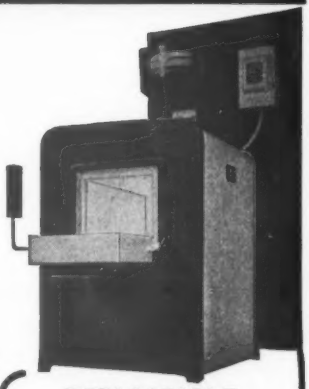
AVAILABLE IN TWO SIZES

Type	*Chamber Capacity*	*Amps 115 V*	*Watts*	*Amps 230 V*	*Price*
MH-3	8″W 6″H 14″L	29.6	3400	14.8	$124.00*
MH-4	10″W 6″H 18″L	....	4800	20.9	$191.00*

**Includes Hearth Plate*

MAX. SAFE TEMPERATURE—Continuous operation, 1750° F.; Intermittent operation, 1850° F.

AUTOMATIC CONTROL—Indicating Controlling Pyrometer—Thermo-couple and lead wire complete—$152.40.



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Replaceable nickel chromium resistors embedded in rectangular refractory blocks. Elements form inner walls of furnace chamber, and may be replaced easily and quickly after removing rear panel — furnace structure remains undisturbed.

FREE—Complete data covering specifications, additional applications and ordering instructions are included in this new folder. Write for your copy today. Ask for Bulletin No. 50.

COOLEY ELECTRIC MANUFACTURING CORP.
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pages assist in the determination and selection of the right screw for any given application. The catalog also includes a 12-page section devoted to screw and screw thread standards as approved by the American Standards Association.
INFORM-A-GRAM KEY No. D6-W

HIGH PRODUCTION TAPS are illustrated in a circular prepared by the HY-PRO TOOL CO., Dept. J, 489 Mt. Pleasant St., New Bedford, Mass. Hy-Pro Taps are packed in sturdy boxes containing 3 or 12 taps with wooden trays separating each tap. Each box is completely labeled to give a complete description by material, kind, classification of thread, size, point, number of flutes, limit number, and catalog or special number. The stock man can tell what is on hand at a glance instead of opening each box in his search.
INFORM-A-GRAM KEY No. B41-W

NEW DRILL CHUCKS for holding "Shankless" High Speed Twist Drills are described in an illustrated Drill Chuck Catalog issued by SCULLY-JONES & CO., Dept. TJ, 1901 S. Rockwell St., Chicago 8, Ill. The new Scully Chuck is a collet-action driver, designed for driving Shankless Drills in any machine having a spindle, holder or attachment with a Morse taper hole. This Chuck is furnished with a Morse taper on the outside and has a straight hole the same diameter and length as the neck of the Shankless Drill.
INFORM-A-GRAM KEY No. C92-W

FACE SHIELDS are pictorially described in a 4-page catalog recently released by the Safety Div. of the BOYER-CAMPBELL CO., Dept. T, 6540 Antoine St., Detroit 2, Mich. There are the "100", "200", "300" and "400" models, each identified by a variance of headgear but all designed upon the primary premise of comfort. For each model of the "hundred series" there is a choice of three different thicknesses and three different sizes of cellulose acetate general purpose windows, and three different sizes of 24-mesh screen windows for heat protection as well as a fiber front for use when scarfing and welding. Complete specifications and prices are included.
INFORM-A-GRAM KEY No. 67-W

THE SHAPEMASTER—Almost any desired shape can be transmitted by this tool to either the outside or inside diameter or face of the work. Perfect squares, hexagons and octagons with square corners can be turned and bored. The Shapemaster is a Monarch lathe handling work up to 20" in diameter. It can make specially shaped punches and dies, broaches for plastic molds, as well as machine various types of special shapes in work pieces themselves. Examples of the Shapemaster's work are shown in Bulletin No. 199 published by the MONARCH MACHINE TOOL CO., Dept. TD, Sydney, Ohio.
INFORM-A-GRAM KEY No. 538-W

INSTA COOLANT CUTTING COMPOUND—a scientifically compounded colloidal concentrate is now available as a cutting compound for use in drilling, hobbing, reaming, milling and grinding all metals. A 4-page folder issued by the FINEGAN-CAMPBELL CO., Dept. TJ, 1925 McGee St., Kansas City 6, Mo., explains its use, what it will do, and what it has done for some industries recently. InSta "G", InSta "L" and InSta "Wax" have each been developed to meet a specific cutting and grinding requirement. They are packed in 8 lb., 40 lb. and 400 lb. containers.
INFORM-A-GRAM KEY No. 968-W

NEW ABRASIVE CUTTING CATALOG which features the Campbell Hudorkut Model No. 1 Abrasive Cutting Machine has just been released by the Andrew C. Campbell Div., AMERICAN CHAIN & CABLE CO., INC., Dept. TD, Bridgeport 2, Conn. Typical pieces cut and close-ups of the cutting action along with interior and exterior pictures of the machine are shown. These machines are designed to cut up to 4" stock, smoothly and cleanly. All cutting is done by immersing the work in coolant. They will cut practically any material and are ideal for laboratory or metallurgical work.
INFORM-A-GRAM KEY No. 185-W

MOUNTED WHEELS & POINTS are described in a 56-page illustrated booklet recently issued by BAY STATE ABRASIVE PRODUCTS CO., Dept. TDJ, Westboro, Mass. There are no soft and hard spots on these wheels and points. Illustrations show typical applications where these tools are being used. Bay State "C" abrasive (silicon carbide) is recommended for materials of low tensile strength, such as rubber, pearl, granite, gray iron, brass, bronze, etc. Standard shapes and sizes with identifying shape numbers are illustrated.
INFORM-A-GRAM KEY No. 205-W

TABLET MAKING EQUIPMENT is described and illustrated in Catalog 11 published by the ARTHUR COLTON CO., Dept. T, 2600 E. Jefferson Ave., Detroit, Mich. Their rotary tablet machines are particularly adapted to make any special shaped tablets, such as hexagon, octagon, oval, etc., as easily as to produce round ones. The 3-B Multiple Punch Tablet Machine will produce from 300 to 500 tablets per minute, dependent upon their size.
INFORM-A-GRAM KEY No. D11-W

YOUNG'S OPTICAL GAGING COMPARATOR, designed to meet modern mass production of intricate parts and ordnance materials, is pictorially described in a 4-page bulletin issued by ADROIT MFG. CO., INC., Dept. J, 92 Warren St., New York 7, N. Y. This machine is used principally for gaging, in multiple stages, complete contours of intricate parts in one operation, or one dimension can be gaged at a time by a shadowed image formed of an object under high magnification. Various

FAST, UNIFORM PART MARKING...

WITH THIS *Improved* MERCURY TYPE HOLDER!

If the metal parts you manufacture require accurate marking or numbering for easy identification, this improved Mercury Type Holder is an outstanding help in *simplifying* your marking job!

This tool holds the *entire part number*—up to 20 characters if needed. Each character is rigidly aligned and held in place so that, with a single blow of a hammer, the entire number is clearly and neatly stamped on the part. It's fast, fool-proof—and entirely eliminates the time normally consumed when using dies for each separate letter or figure. Moreover, such common errors as wrong sequence, strike-overs, overlapping numbers, etc., are no longer a problem with the Mercury method!

INTERCHANGEABLE TYPE

And here's an outstanding feature: the Mercury Holder accommodates five type sizes, and all type is quickly interchangeable to meet a whole range of numbering needs. So, with even a single Holder and a selection of type sizes, you can be ready for any numbering job that comes along! The Mercury Holder is *compact*, important when working with small parts . . . it is of all-steel *machined* construction for long life . . . it has just four simple parts . . . and it has many other important features you should know about. Hardened and ground hand cut steel type is available in a full range of sizes.

Full details, including ordering data and specifications for both hand and press style holders, are available for the asking. Write Department D today!

IMMEDIATE DELIVERY!

MERCURY METAL DIE AND LETTER CO.

546 EAST 16TH STREET, LOS ANGELES 15, CALIFORNIA

magnifications from 18 to 31½ can be had without changing the lens by sliding the mirror back and forth.
INFORM-A-GRAM KEY No. 881-W

LOW TEMPERATURE WELDING RODS, and the problems which concern maintenance, are discussed in a 6-page folder just published by EUTECTIC WELDING ALLOYS CO., Dept. D, 40 Worth St., New York 13, N. Y. No new equipment is required for these new "low temperature" rods; all that is necessary are the new EutecRods which can be used with any oxyacetylene torch or arc equipment. For welders, the new folder describes Eutectic's exclusive procedures fully, in which the rods, applied at low temperatures to cast iron, steel, aluminum, bronze, etc., produce clean, strong bonds yet leave the welded part easily machinable. The strength of the machined part is unimpaired and no distortion takes place, a very important consideration in repair work. There are many suggestions for salvaging parts consigned to the junk pile.
INFORM-A-GRAM KEY No. 81-W

SAFETY MARKING TOOLS are described in a colorful 4-page bulletin issued by M. E. CUNNINGHAM CO., Dept. J, 104 E. Carson St., Pittsburgh 19, Pa. Details on their letters, figures, symbols, and holders are included. A wide variety of safety data and inspection symbols are shown. These stamps are constructed from patented Safety Steel, and are designed for every marking purpose in any industry, by hand or mechanical methods.
INFORM-A-GRAM KEY No. 170-W

MEASURING INSTRUMENTS & CONTROLS are featured in a 28-page "General Catalog" issue of "Modern Precision" published by the LEEDS & NORTHRUP CO., Dept. J, 4934 Stenton Ave., Philadelphia 44, Pa. All L & N products for regulating plant processes are briefly described. Their four pyrometric methods for measuring include Thermocouple, Rayotube, Thermohm and Optical. Another section is devoted exclusively to a discussion of L & N heat-treating furnaces, with a page describing and illustrating each method: Vapocarb-Hump Hardening, Homocarb Carburizing, Homo Nitriding and Homo Tempering.
INFORM-A-GRAM KEY No. 360-W

AIRCRAFT SCREW PRODUCTS are featured in Bulletin No. 239 recently issued by AIRCRAFT SCREW PRODUCTS CO., INC., Dept. T, 47-23 35th St., Long Island City 1, N. Y. This bulletin has been designed to give the reader a condensed picture of "Heli-Coil" Inserts and the "Aero-Thread" Screw Thread System. It includes elementary engineering data; brief statements of the advantages of these two designs; typical applications of both; and material on the tools needed for installation.
INFORM-A-GRAM KEY No. 177-W

NEW DIP TANK CATALOGS containing complete specifications covering insulated Hot Dip Tanks that are heated by manufactured gas, natural gas, or electricity, and thermostatically controlled, have recently been issued by the AEROIL BURNER CO., INC., Dept. T, Box BG, West New York, N. J. Illustrations and specifications cover their Dip Tanks as used for metal cleaning, degreasing, rustproofing, finger print neutralizing, black oxide finishing, paint stripping, heating, melting and dipping waxes, electrical compounds, rosin, glue, chemicals, ethyl-cellulose plastic strip coatings and similar industrial compounds and applications.
INFORM-A-GRAM KEY No. 776-W

"STORIES OF MEEHANITE IN INDUSTRY" is the title of Bulletin No. 22 recently published by the MEEHANITE RESEARCH INSTITUTE, Dept. TJ, Pershing Square Bldg., New Rochelle, N. Y. Its 128 pages consist of a collection of articles about Meehanite Castings which have appeared in various trade publications. They are divided and indexed according to the following ten main subject heads: Properties, Design, Gears, Dies, Brake Drums, Crankshafts, Hardening and Heat Treatment, Marine Castings, Machinery and Milling Cutters, and Miscellaneous Castings.
INFORM-A-GRAM KEY No. 388-W

DRILL PRESS TURRET ATTACHMENT is described in a circular released by the MACHINE DEVELOPMENT CO., Dept. J, 516 Fifth Ave., New York 18, N. Y. It tells how the MADCO Turret Head converts a single spindle drill press to multiple spindle production work thus enabling six consecutive drilling operations such as spot-facing, drilling, counter-boring, reaming, etc., to be performed without having to change tools. An illustration shows the MADCO Head attached to a popular make drill press and equipped with a Jacobs adjustable chuck and three MADCO screw chucks for holding special tools.
INFORM-A-GRAM KEY No. B51-W

ARCALOY TOOL STEEL WELDING ELECTRODES, manufactured in six types, i.e., oil hardening, water hardening, air hardening, hot working, high-speed and work hardening are described in a 24-page illustrated booklet issued by ALLOY RODS CO., Dept. TD, York, Pa. Since the work hardening type is nonmagnetic it will not pick up metal particles that cause scratching and scoring on drawing dies. It will also withstand very high impact on forging dies and is machinable "as welded." The other five types will meet every other die condition (cold cutting, hot cutting, hot or cold wear, impact in varying degrees, surface hardening, etc.) and thus any existing die may be repaired by using an electrode of the same type, or any die may be duplicated as to function by using the proper type of tool steel weld deposit to meet any or several types of work requirement.
INFORM-A-GRAM KEY No. D14-W

What is DIE-LESS DUPLICATING?

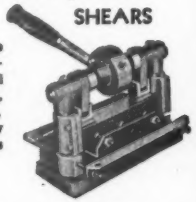
Here is a simple 3-STAGE explanation:

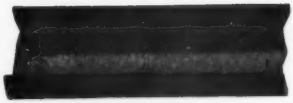
"DIE-LESS DUPLICATING" might be described as a new industrial technique made possible by the accuracy, extreme adaptability and ease of operation of DI-ACRO Precision Machines—Shears, Brakes, Benders—especially when used as a continuous, integrated production process.

←1ST STAGE . . .

Cutting flat material to size and shape for part to be duplicated. The DI-ACRO shear rapidly resizes and squares material, also makes slits, strips, notches, angle cuts, etc. Guides, stops and blade pitch are all quickly adjustable. 3 sizes—shearing widths 6", 9", 13".

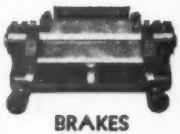
SHEARS





←2ND STAGE . . .

Forming angles, channels or "Vees" from sheared flat material. The DI-ACRO Brake forms any angle from 0° to a maximum of 110°. Contact surfaces are adjustable and may be slotted, recessed or altered as needed for the parts required. 3 sizes—folding widths, 6", 12", 18".



BRAKES

←3RD STAGE . . .

Bending sized and formed material to simple, compound or reverse curves of desired radii. The DI-ACRO Bender handles angle, channel, moulding, rod, tubing, wire (round, square, flat), strip stock and other ductile materials in a remarkably wide range of accurate contour forming. 3 sizes—radius capacity 3", 6", 9", handling up to ½" cold rolled steel bar.

BENDERS

DO YOU HAVE DUPLICATE PARTS TO FORM? . . . .

The DI-ACRO System of **METAL DUPLICATING WITHOUT DIES** has proven its adaptability in making parts just as accurately as can be done with dies, to a tolerance of .001" in all duplicated work. The delay of waiting for dies is avoided—deliveries speeded up. Changes needed in production can be made simply by adjustment of DI-ACRO Precision Machines, which are also widely used for laboratory and research work, making models, etc. Production work is often done in excess of 1,000 operations per hour, by girls or inexperienced workers.

←Pronounced "DIE-ACK-RO"

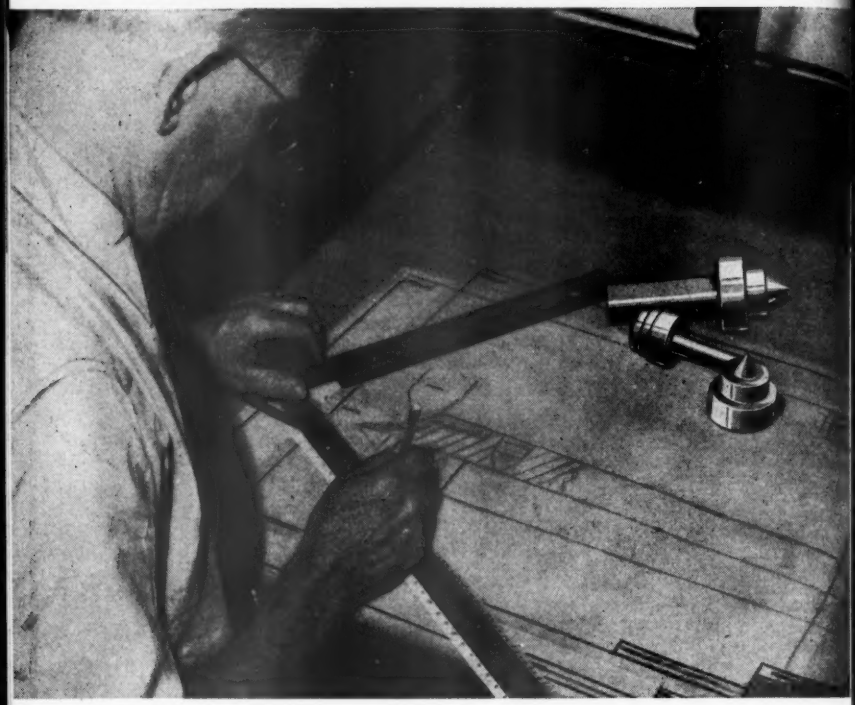
Send for Catalog—
"DIE-LESS" DUPLICATING

It gives full details on all models of DI-ACRO Shears, Brakes, Benders, and many examples of parts made with "DIE-LESS DUPLICATING".

DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO.

315 EIGHTH AVE. SOUTH **MINNEAPOLIS 15, MINNESOTA**



ENGINEERED LIVE CENTERS

A properly designed Live Center is one of the fundamentals of setting up a job and requires a specialist's experience. Characteristic of the design of all STURDIMATIC LIVE CENTERS is a low overhang and a slight cushioning action that compensates for expansion due to heat shock and excessive thrust loads—reducing wear to a minimum. Send us your blueprints and specifications—we will see that your job gets set up with the right Live Center. Standard shanks with Morse taper carried in stock.

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INDUSTRIAL DIGEST

SCIENCE • RESEARCH • METHODS • TOOLING
PRODUCTION • TRADE NEWS AND REPORTS

Yoder Heads New U of M Research Center

Establishment of an "Industrial Relations Training and Research Center" at the University of Minnesota, to train personnel for management and labor leadership, has been announced by President Walter C. Coffey.

The new Center, one of seven in the United States, will be under the direction of Dr. Dale Yoder, professor in the School of Business Administration and a public member of the sixth Regional War Labor Board.

The Center will offer special courses for men and women now employed in the labor and management fields, or preparing to enter either field. Among courses to be provided by the Center are those to train workers as job analysts, interviewers, personnel counselors, employment managers, training supervisors, personnel directors, leaders and research workers in organized labor and other similar positions. It will also make extensive studies of labor-management problems in the Northwest, including those of unemployment, wages, hours, labor costs, salary administration, collective bargaining, selection and placement, seniority, promotions and transfers and employee morale. Findings of the studies will be available to industry, labor and the public "to encourage mutual understanding as a basis for cooperation".

President Coffey has appointed an advisory council of representative citizens of Minnesota to aid in guiding the work of the Center as well as an advisory committee drawn from four major divisions of the University. Establishment of the Center is the outgrowth of more than a year of study of training and research needs in labor and industrial problems and relations in the Northwest.

Dr. Yoder, the Center's director, has been in charge of personnel training in the School of Business Administration since 1935. On leave from the University from 1942 to 1944, he served in Washington for more than a year as chief of the Planning Division, Bureau of Program Planning and Review, War Manpower Commission. In September 1943 he became vice chairman of the Sixth Regional War Labor Board with headquarters in Chicago. He now still serves as a member of the Regional Board and is chairman of its wage rate committee.

Pressed Metal Institute Philadelphia Meeting

The principal speaker at a recent District Meeting of the Pressed Metal Institute held in Philadelphia was C. R. E. Merkle, manager, Technical Sales Development, E. I. du Pont de Nemours Company. J. H. Robins, president, American Pulley Co., presided as chairman. More than 90 local members of the Institute were present. Mr. Merkle spoke on "The Protection and Decoration of Pressed Metal with Organic Finishes", pointing out the importance of proper finish for steel stampings, the great strides made during the past few years in development of various new finishes, and the outlook for organic finishes on steel stampings as a means toward appearance and utility.

Oliver F. Fancey, representing WPB, expressed their appreciation for the work being done by the Pressed Metal Institute and stamping manufacturers. He stated that stampings are becoming increasingly important in war material production and that cooperation by the industry has proven of great practical value. W. W. Galbreath, Head of Stamping Section of WPB, outlined ways and means that members of the Institute can secure assistance of WPB, in solving individual and industry problems. He stressed the value of the source bulletins issued by the Institute, which purpose to locate new or additional sources for required stampings.

Five new members of the Pressed Metal Institute were introduced as follows: Hill-Chase and Company, Edgecomb Steel Company, United Specialties Company, Steel Distributors and J. C. H. Automatic Machine Works.

Walter C. DeMaris, business manager of Heintz Manufacturing Co., was elected chairman, and W. A. Gorrell, president, E. J. McAleer & Co., vice-chairman of the Philadelphia District for the current year.

Contract Settlement Procedures

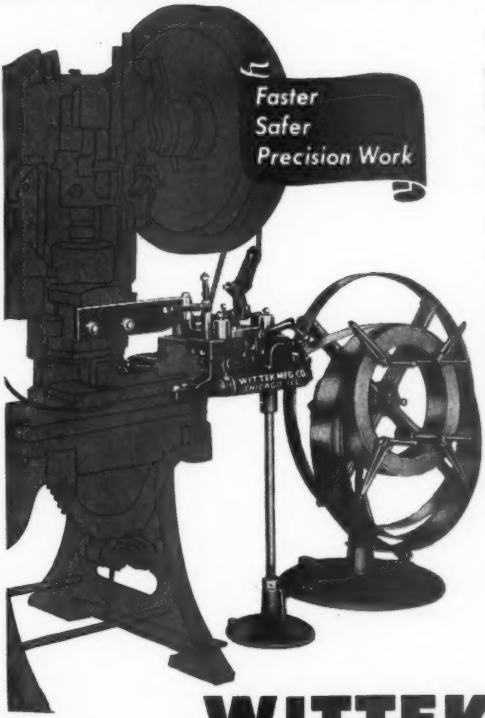
New Contract Settlement Training Guide is a publication of the Contract Settlement Advisory Board's Committee on training to prepare war contractors for handling contract settlement. This booklet is designed to provide basic information for termination coordinating committees which have charge of local contractor training programs and reflects uniformity among government agencies on contract settlement. The new program, built around a four-hour course for contractors, marks a departure from previous contract settlement instruction. It gives the contractors actual practice in filling out settlement proposal forms and in solving practical problems dealing with such subjects as termination inventories and scrap disposal. The new short course is part of the nationwide program to assist prime and sub war contractors to obtain settlements if their war contracts should be terminated. The booklet outlines the procedures and principles to be followed in both national and local training programs. Subjects covered include brief talks, single meetings and multiple-session courses, technical sessions on inventory and plant clearance, accounting and others. Copies are available from the Office of Contract Settlement, Federal Reserve Building, Washington 25, D. C.

Standards Advisory Committee

An advisory standards committee of eight industrial executives, with Charles E. Wilson, President of the General Electric Co., as chairman, has been appointed by the Secretary of Commerce to advise the Department of Commerce and the American Standards Association on future plans for standards work. This appointment is the first result of a conference of fifty business leaders held in New York in January at the invitation of the Secretary of Commerce to make recommendations to him concerning relative roles to be played by government and industry in standards activity. Others serving on the committee are: Frederick M. Feiker, Dean of Engineering at George Washington University; Clarence Francis, Chairman of the Board of General Foods Corporation; Ephraim Freedman of R. H. Macy & Co., Inc; Frank B. Jewett, President National Academy of Sciences; Wm. B. Warner, President McCall Corp.; Arthur D. Whiteside, President Dun & Bradstreet, Inc.; and R. E. Zimmerman, Vice-President U. S. Steel Corp. The conference, presided over by Wayne C. Taylor, Undersecretary of Commerce, recommended that industry should provide strong leadership in development of national standards, in full cooperation with the government. They expressed, in a formal resolution, the opinion that "the rapid growth of standards activities, their extension into new fields, and the bearing of standards upon production and sale all make it important for top management to give attention to this matter and to provide for its orderly development". Standards for consumer goods were discussed in the conference, it being the general view that post-war years could see extensive developments

Planning Peacetime Production Using Coiled Strip Stock?

Equip with WITTEK Automatic Roll Feeds and Reel Stands



Wittek Roll Feeds are being used extensively by war plants in their large volume production of high quality metal stampings. The flexibility of Wittek Roll Feeds will assist these plants in their peacetime conversion through their adaptability to various jobs. Keen competition will demand the utilization of equipment to its point of highest efficiency. If your postwar plans include punch press production of parts from coiled strip stock—investigate now the many possibilities of Wittek Roll Feeds and Reel Stands.

Write for catalog, prices and recommendations

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in this field. This part of the discussion could be summarized, by one member's statement that, "However much we have differed on details, there is one point upon which there has been unanimous agreement, namely: that our customers are entitled to full information in regard to the products they buy from us".

Standard Safety Color Code

Drafts of a safety color code are now being circulated to industry for criticisms and suggestions. Just as the colors used in traffic lights were unified on a national scale through the work of the American Standards Association, so the Association has now worked out a uniform safety color code for national acceptance. It is the purpose of this code to unify on a national scale the colored markings used to serve as a warning to employees of certain physical dangers to be avoided, to mark the location of safety equipment, and to identify fire and other protective equipment. The meaning assigned to a color would be the same to employees of a garage in New York as to the workers in a boiler factory in Toledo, Ohio.

The job was undertaken at the specific request of the War Department but it also has a wide application in industry. Neither the War Department nor industry intends to use color markings as a substitute for adequate guards or other safety measures but to supplement them. The paint manufacturers in particular have pioneered in the use of color as a safety aid. Codes already set up by private companies have been studied and the psychological reaction to colors taken into consideration, for example the association of red with danger. It is claimed that the first 30 seconds after a fire starts is the most important period in fire fighting, hence the use of color to identify fire-fighting equipment. In fact there is a long history of the use of specific colors to prevent accidents. The chief job of the committee has been one of unifying on a national scale what has already been done.

Colored signals and signs as used in the operation of ships, railroads, automobiles or airplanes make it possible for a person, unable to read in the language used on the sign, to know that the sign indicates danger, caution or safety as the case may be. All of these in a sense paved the way for the over-all color safety code now completed. The ASA Committee responsible for this job needs all the help it can get from manufacturers in the way of criticisms and suggestions on the draft now being circulated. Any company may obtain a copy of this draft standard Safety Color Code for Marking Physical Hazards (Z53) by writing to the American Standards Association at 70 East 45th Street, New York 17, New York. There is no charge.

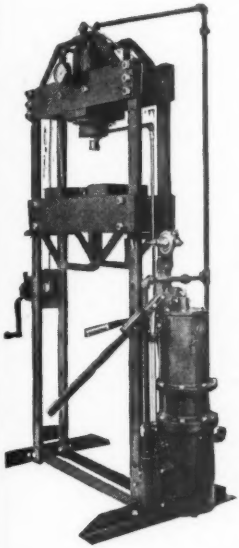
Praise for Industry Advisory Committees

Members of the OPA Industry Advisory Committees were given public recognition by Price Administrator Chester Bowles following the presentation of individual certificates of award to the members of the agency's steel castings industry advisory committee at a regular meeting of the committee in Chicago, February 13. Mr. Bowles lauded advisory committees who for two years or more performed outstanding service in "helping the economy withstand the strains of global war". In January similar awards went to members of the iron and steel scrap industry advisory committee. Special awards will be made, Mr. Bowles stated, when committees that have been in operation for as long as two years are cited by OPA officials as deserving of special notice. Mr. Bowles said that the "OPA now has 517 industry committees with a total membership of 6,643 persons". He continued, "It seems noteworthy to me that this large group of business people would agree to spend much time, money and effort to help their government. When you consider that their job has been to help OPA limit the prices they can charge for the goods and service they sell in their own places of business, you appreciate more fully that they have shown real patriotism as well as farsighted business sense".

Adaptable to any job, these

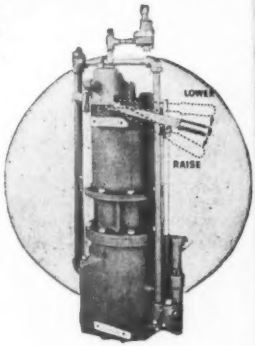
Low-Cost KRW

HYDRAULIC ARBOR PRESSES SAVE TIME, SPACE AND MONEY



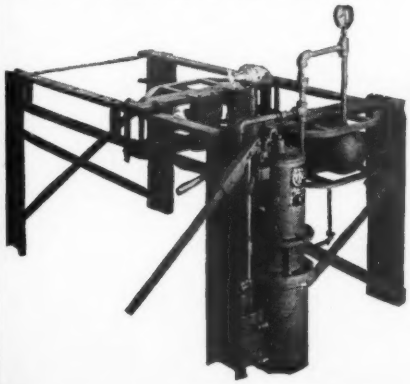
KRW Presses are designed to handle the great majority of pressing, bending and straightening operations normal to most industries. In addition, KRW Presses are adaptable to literally hundreds of special jobs. Using low-cost dies, manufacturing costs on many items are greatly reduced.

Using air pressure varying from 100 to 225 pounds, the resulting hydraulic pressure varies with the air pressure used. A built-in air regulator permits exact duplication of pressure on every stroke . . . this is important on many operations. KRW Hydraulic Arbor Presses are available for either vertical or horizontal operation or specially built to handle a particular operation. We also manufacture suitable capacity air compressors. Write for fully-illustrated Hydraulic Arbor Bulletin. K. R. WILSON, Dept. 18, 215 Main St., Buffalo 3, N. Y.



THE KRW SPEEDI-BOOSTER

THE REASON WHY KRW PRESSES ARE FAST AND ACCURATE. The KRW Speedi-Booster eliminates the need for the conventional Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.



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Technologists Needed in Federal Service

The need for Technologists in the Government service continues, it is announced by the Civil Service Commission. Vacancies exist in Washington, D. C., and throughout the country in such agencies as the War and Navy Departments, the Department of Agriculture, and the Department of the Interior. The salaries range from $2,433 to $6,288 a year including overtime pay.

Technologists are especially desired who have had experience in testing, development, or production in the following industries: coal; food; fuels (liquid); paint, varnish and lacquer; petroleum; synthetic resins and plastics; electrochemical; and process metallurgical. There will be no written test. For the lower grade positions, at least 3 years of experience in technology is required, unless appropriate education is substituted. Additional professional experience is necessary for the higher grades. There are no age limits.

Interested persons may secure copies of the announcement of these positions at the nearest first- or second-class post office, or by writing direct to the U. S. Civil Service Commission, Washington 25, D. C. The announcements contain complete information regarding the requirements and duties of the positions, and instructions for applying.

Federal appointments are made in accordance with War Manpower Commission policies and employment stabilization programs.

Cleveland Pneumatic's 50 Years

The Cleveland Pneumatic Tool Co. is celebrating their 50 years of business progress. They are manufacturers of pneumatic tools, rock drills, aircraft landing gear, and motor vehicle shock absorbers. The company was founded in 1894 by Claus Greve who emigrated to America from Denmark. Cleveland Pneumatic has grown from his original 10-man shop to become one of Cleveland's outstanding manufacturers. The first products manufactured by this company were riveters, chippers and a two-cylinder, oscillating type drill. Shortly after World War I, Cleveland Pneumatic launched a completely new product—the Cleco-Gruss Shock Absorber—which was first used on automobiles and then spread swiftly to trucks and buses. In 1926 as the world became air conscious, Cleveland Pneumatic applied the Cleco-Gruss air-oil principle to absorbing the shocks of aircraft landings and inevitably undertook an important role in the development of modern aviation. Today the Euclid, Ohio, plant of Cleveland Pneumatic Aerol, Inc., is the world's largest plant devoted exclusively to straight-line manufacture of airplane landing gear. The Cleveland Pneumatic Tool Co. has prepared a 16-page, beautifully illustrated booklet entitled "Pioneers for 50 Years" which is available upon request.

Screw Machine Products Demand Up 80 Percent

Requirements for screw machine products are approximately 80 percent greater at present than in January 1944, as a result of increases in major ammunition programs, WPB officials informed the Screw Machine Products Industry Advisory Committee at a recent meeting. Artillery fuses and boosters, and mortar fuses are the most urgently needed items for which screw machine products must be provided.

The chief factor now limiting production of screw machine products is the lack of skilled manpower according to industry members. Discussion brought out that from three to four years training is required for a skilled worker. It was reported that the industry is producing at only 60 percent of its capacity, due to its loss of skilled workers. To bring production up to its full capacity of existing facilities a maximum of 5,000 set-up men are needed, according to industry member estimates, and if these can be obtained an additional 50,000 workers can be used.

Additional facilities must also be brought into production, Government

Precision HONING

of diameters from .185" to 2.625" with a guaranteed accuracy of .0001"

With the Sunnen Precision Honing Machine you can hone and finish any internal cylindrical surface in any metal or plastic except lead or babbitt. Holes are straight and round and the surfaces produced are super-smooth—often from 2 to 3 micro-inches. This means longer life of parts, fewer rejects, and greater interchangeability of parts.

Here is a real precision machine that will increase production without the need for skilled labor. Any mechanically inclined worker can learn to turn out precision work in a few hours' time.

Let a Sunnen engineer show you how it can be used in your shop—on your jobs—or write for bulletin giving complete information on all the advantages of this machine.

SUNNEN PRODUCTS CO. 7947 Manchester Ave., St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

SUNNEN HONING

Speed • Accuracy • Finish

officials pointed out. A canvass of the industry is difficult since it consists of some 3,000 firms, producing on both a jobbing and integrated plant basis. Industry members have been asked to assist in locating idle facilities by WPB officials.

$1000 Prize Contest for Technical Papers on Resistance Welding

In order to encourage the preparation of outstanding papers dealing with resistance welding subjects, the Resistance Welder Manufacturers Association, Philadelphia, Pa., has for several years conducted a prize contest, the awards for which are announced annually at the fall meeting of the American Welding Society. The scope of this contest has recently been increased, bringing the total amount of the awards up to $1000. The prizes are to be awarded as follows:

One prize of $500 for the best paper emanating from an industrial source, consulting engineer, government laboratory, or the like, in which the major portion of the subject matter is concerned with design for resistance welding. This includes design of component parts to accomplish the maximum economy and welding quality and also details of procedure, work preparation and work handling, etc.

Two prizes of $200 each will be awarded to the authors of two papers, not primarily concerned with design, which, in the judgment of the Board of Awards, are the greatest original contributions to the advancement and use of resistance welding. One of these two prizes shall go to the best paper emanating from a university source—that is, either an instructor, student, or research fellow at a recognized university. The second of these two prizes shall be awarded for the best paper emanating from an industrial source.

A fourth prize of $100 will be awarded to the author of the best remaining paper, which may fall in any of the three groups mentioned above.

The contest is open to anyone, without restriction, from the United States, its possessions and Canada. It is also open to any member of the American Welding Society in any grade from any place in the world. The contest is considered as having opened September 1, 1944, and will close at midnight, July 31, 1945. Papers which are to be presented at the Annual Meeting of the American Welding Society in October may also be entered in this contest, in which case a draft or copy of the paper must be filed with the American Welding Society not later than July 31, 1945.

All papers submitted in the contest become the joint property of the RWMA, and the American Welding Society, who will retain all rights thereto. The American Welding Society will appoint three judges, who will judge the relative merits of the various papers submitted and make the awards accordingly. The decision of the judges will be final.

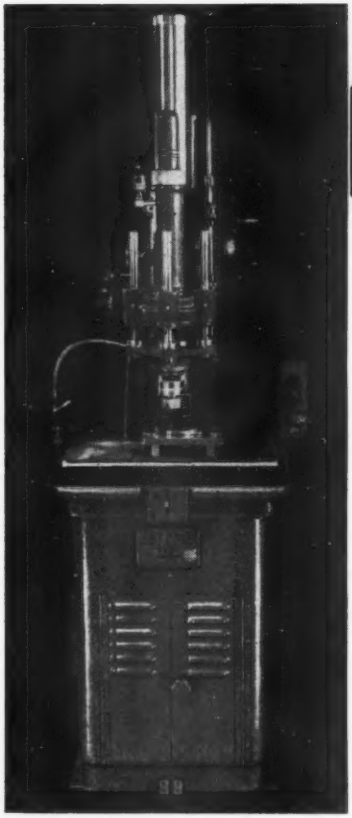
For the author or authors to be eligible for this award, the paper shall describe clearly original work done by them or under their supervision on resistance welding in any of its aspects by any method or process. The paper shall be a full disclosure of the subject. The paper shall contain no statement which is unethical advertising or sales promotion. The paper may contain statements of fact, including the names of either individuals or organizations of any kind, commerical designations, trade names, etc. The minimum length requirement is 2500 words.

All papers must be typewritten, double spacing, written on one side only of blank white paper. Photographs, charts, graphs, etc., may either be attached directly to the copy or may be detached, in which case they should be clearly identified with figure numbers, captions, etc.

Industry-Veteran Relationships

Proper handling of discharged veterans on their return to civilian jobs in industry is a supervisory problem that foremen and department heads must learn now, Allan R. Cullimore, president of the Newark College of Engineering, has warned industry in the current special issue of *Management Information*, "How to Handle

180% Increase in production
25% Increase in tap life
Fewer rejects



With *unskilled women* operators replacing trained men, Flint Manufacturer's Machine Service Co. obtained the above results by using a DETROIT Light Duty LTM-16 lead-screw type tapping machine equipped with simple locating pins on the work table and floating tap holder.

The job involved was tapping a $\frac{7}{16}$-20 NS thread $\frac{3}{4}$ in. deep to a class 3 fit in a 50 cal. machine gun part made of tough 1050 steel.

Production obtained was 450 pieces per hour, equivalent to 8 seconds per piece floor to floor. The high accuracy obtained is credited to the unique LEAD SCREW drive.

We will be glad to furnish you with a bulletin covering these tapping machines. Ask for Bulletin LTM-44.

DETROIT

TAP & TOOL CO.

8432 Butler Avenue Detroit 11, U.S.A.

Our Returning Veterans."

"In spite of all that management can do in placing these men, the burden of working out their salvation is going to lie chiefly with the supervisor," he says, "and he ought to understand pretty definitely a few of the simple things that lie back of success in handling them."

"The key to effective readjustment of the returned veteran," Mr. Cullimore states, "is to supervise him the same as you would any other man. The supervisor must remember to let the veteran help himself. He must realize that the supervisor's job is to supervise, which means to indicate to an individual how he can be more productive for his own good and that of the company."

A complimentary copy of the special issue of *Management Information*, "How to Handle Our Returning Veterans," will be furnished to any company executive on request to the publishers, Elliott Service Company, 219 East 44th St., Dept. P-1, New York 17, N. Y.

RWMA Program

The Resistance Welder Manufacturers Association has inaugurated a program of cooperative educational activity on the subject of resistance welding. A large percentage of firms now using resistance welding in production are planning to do more as recent surveys in the metal industry have shown. The main objective of the educational program will be to encourage and to assist this expanded use by making more widely available a knowledge of the advances in design, in welding techniques and in fabricating procedures made during the war production period. This program is a continuation of the association's established activity in sponsoring research projects, cooperating with interested engineering societies and developing equipment standards and recommended practices. In the educational work special attention will be given to assisting design engineers to improve both product and production by designing component parts specifically for the welding process to be used; encourage use of recommended practices to realize maximum economies and consistent good quality from the application of resistance welding; establish the fundamental principles of resistance welding as a basis for proper application of the process; and to interpret research results to design engineers and production executives. Harold S. Card has been appointed educational director in charge of this program with headquarters in the Citizens Building, Cleveland 14, Ohio.

Recent U. S. Patents

Among recently issued U. S. Patents the following are of Tooling interest. If you are interested in studying any of these Patents, simply advise "Patent Information Service," The Tool & Die Journal, 2460 Fairmount Blvd., Cleveland 6, Ohio, enclosing 20 cents for each Patent desired and we will gladly forward your order to Washington.

SPINDLE CONTROL MECHANISM, No. 2,348,973.
FLANGE FORMING DIE ASSEMBLY, No. 2,348,998.
SELF-LOCKING SCREW DEVICE, No. 2,349,592.
SELF-LOCKING SCREW DEVICE, No. 2,349,593.
MACHINE TOOL CONTROL MECHANISM, No. 2,349,595.
LUBRICATION SYSTEM FOR MACHINE TOOLS, No. 2,349,597.
HYDRAULIC SYSTEM FOR MACHINE TOOLS, No. 2,349,602.
MAGNIFYING ATTACHMENT FOR MEASURING INSTRUMENTS AND THE LIKE, No. 2,349,604.
HONING TOOL, No. 2,349,628.
SCREW THREAD FOR HIGH STRENGTH BOLTING, No. 2,349,651.
WIRE DRAWING DIE, No. 2,349,652.
AUTOMATIC HEIGHT GAUGE TAPPER, No. 2,349,667.
COMBINATION COMPASS AND MEASURING INSTRUMENT, No. 2,349,670.
DRILL SOCKET CONSTRUCTION, No. 2,349,741.
GRINDING WHEEL FEEDING MECHANISM, No. 2,349,786.
DRESSING TOOL, No. 2,349,793.
MOLDING PRESS, No. 2,349,805.
MOLDING PATTERN, No. 2,349,806.
APPARATUS FOR SURFACE HARDENING SHAFTS AND THE LIKE, No. 2,349,813.
MICROMETER, No. 2,349,838.
THREAD-ROLLING TOOL, No. 2,349,862.
THREAD-ROLLING TOOL, No. 2,349,863.
DIE, No. 2,349,920.
REFACING AND RESEATING TOOL, No. 2,349,948.
GUIDING UNIT FOR REPRODUCING MACHINES, No. 2,349,954.
REPRODUCING MACHINE GUIDING UNIT, No. 2,349,955.
CUTTING TOOL, No. 2,349,959.
GRINDING AND POLISHING MACHINE, No. 2,349,964.
OPTICAL TESTING OR MEASURING APPARATUS, No. 2,349,989.
ABRADING TOOL, No. 2,349,994.
ABRADING TOOL, No. 2,349,995.
PUNCH AND DIE MECHANISM FOR FORMING KNOCKOUTS, No. 2,350,004.

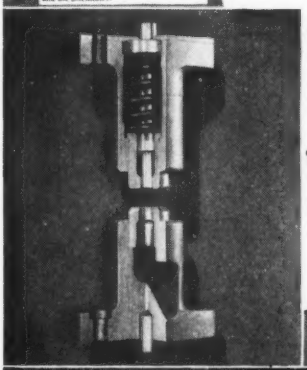
Announcing

WALES

TYPE "CD" HOLE PUNCHING UNITS

THAT REDUCE DIE MAKING TIME TO A QUICK ASSEMBLY OPERATION

Quarter section view of Wales Type "CD" Hole Punching Unit showing relationship of parts of the self-contained punch assemblies and die assemblies.



● Independent, self-contained Type "CD" punch assemblies and die assemblies produce many exclusive time-saving, money-saving advantages. The same group of units may be used and reused in unlimited press brake and stamping press setups.

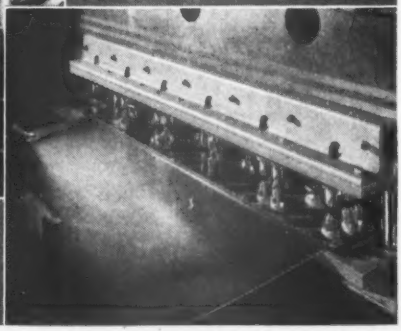
Wales Type "CD" Hole Punching Units eliminate making special punches, punch plates, stripper plates, die buttons, die plates, simplify die design and die making, and standardize punches, dies and stripping mechaniams.

Write for functionally colored catalog TODAY that shows step-by-step set-up methods. The whole story is in one package!

ARMY E NAVY

WALES-STRIPPIT CORPORATION
355 Payne Ave., North Tonawanda, New York
(Between Buffalo and Niagara Falls)
GEORGE F. WALES, President

Scattered, staggered and straight line hole punching patterns may be quickly, easily and economically set up with Wales Type "CD" Units mounted to templates, then to die sets (or mounted direct to die sets) in stamping presses shown at left and in press brakes shown at right.



HIGH PRODUCTION AT LOW COST

REG. U.S. PAT. OFF.

HY-PRO TAPS

By threading more holes per tap you can increase your production and lower tapping operation costs with HY-PRO Ground Thread Taps.

These high production taps are scientifically produced to give longer, more accurate service, and longer wear between sharpenings.

HY-PRO method of packaging makes crush-proof box a miniature tool box that fully protects taps and offers many time-saving advantages. Tension cover prevents spilling and injury to taps. Legible, informative labels are color-coded to save inventory time, and their position on cover prevents mixing of sizes when taps are returned to box.

10 DAYS TO TWO WEEKS DELIVERY OF MOST SIZES

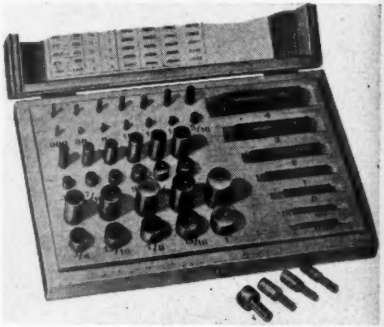
COMMERCIAL PRECISION SPECIAL Ground Thread Taps

Write for Catalog on Company Letterhead

HY-PRO TOOL CO.
New Bedford, Mass., U.S.A.

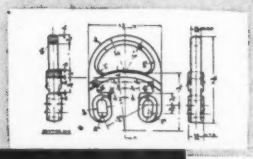
Plug Gage Blanks

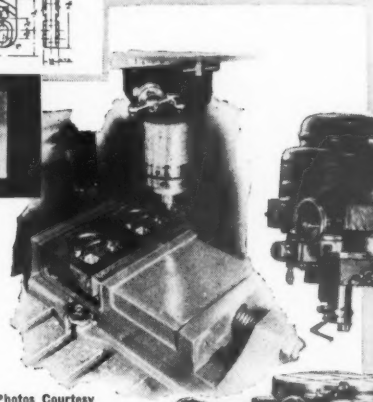
This New Atlantic Emergency Set of cylindrical plug gage blanks and handles is made by the George Scherr Co., Dept. T, 200 Lafayette St., New York 12, N. Y. The blanks are furnished in steps of $\frac{1}{16}$" and will enable the user to make any size of plug gage from .029" to 1.000" by just a few minutes' work on a cylindrical grinder. Grinding is all that is necessary for gages of commercial finish; higher standards of gage finish call for lapping after grinding. A non-deforming, oil hardening, tool steel is used and the gage members are hardened and drawn to Rockwell C61-63. The taper shanks are hardened and drawn to Rockwell C54-58, finish ground and sand blasted. This hardness range between gage member and shank lessens likelihood of breakage. Gage end faces are square with the OD to within .005" total indicator reading per inch diameter and are polished to take identification marking. The centers are clean, true and concentric with the OD to within .003" total indicator reading and are lapped to a 60° bearing surface and are of uniform depth. Being hardened throughout, any gage can be ground down to the next smallest size, thus effecting further economies. With a grinding machine capable of holding work to within one or two ten thousandths, Atlantic blanks can be used for making special size gages on short notice and at a fraction of the cost of finished gages. The blanks are produced in large volume thus keeping the costs far lower than would be encountered in the making of but a few gage blanks at a time.

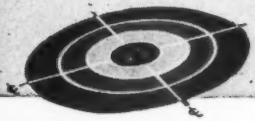


INFORM-A-GRAM KEY No. 490-W

Can you Complete this Brass Die-Casting Die in 22 hours?







Photos Courtesy
McGill Mfg. Co.
Valparaiso, Ind.

Both halves of this high chrome steel die were worked together with all layout, milling and drilling operations being completed in one set-up. The Milwaukee Rotary Head Milling Machine completed the job in 22 hours.

Check these advantages of the Milwaukee Rotary Head Milling Machine and how you can benefit from them in your own shop:

DIRECT . . . mills mold and die cavities in a single set-up without the aid of templets or models.

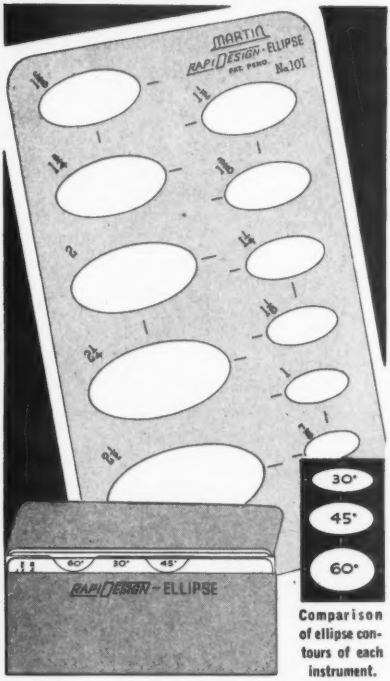
ACCURATE...chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine — transmits mathematical precision to the work.

FAST . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

Write for Bulletin No. 1002C for full information on this unusual machine tool and the Rotary Head method of milling.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • FACE MILL GRINDER • AUTOMETRIC JIG BORER • SPEEDMILL • MIDGETMILL • CENTER SCOPE.

KEARNEY & TRECKER
Products
CORPORATION
Milwaukee 14, Wisconsin
Subsidiary of Kearney & Trecker Corporation



Comparison of ellipse contours of each instrument.

ENGINEERS - DESIGNERS - DRAFTSMEN

SAVE TIME This tested and approved instrument eliminates lengthy old methods of laying out an ellipse—no compass, angles, rules or measurements. Completes ellipse in a "jiffy"—neatly and accurately. The answer to your ellipse problem. Single or set of 3—each instrument gives you 17 sizes—⅜" to 2¾" major axis 30°, 45°, 60° projections.

ORDER YOUR RAPIDESIGN ELLIPSE SET NO. 101 FROM YOUR DEALER OR DIRECT

MARTIN DESIGN STUDIOS
111-B SOUTH ORANGE ST.
GLENDALE 4, CALIFORNIA

MAIL THIS COUPON TODAY

MARTIN DESIGN STUDIOS, 111-B South Orange St., Glendale 4, Calif. . . . Please send me literature describing Rapidesign Ellipse Set No. 101 with prices.

NAME _____

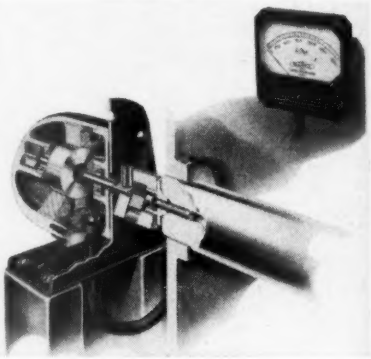
ADDRESS _____

CITY _____

STATE _____

Reliance Electric Speed Indicator

The Reliance Electric Speed Indicator, made by the Reliance Electric and Engineering Co., Dept. J, Cleveland, Ohio, fills the need for a sturdy, low cost indicator, making possible the determining of operation speeds in a broad new field of application. This accurate speed indicator, for speeds from 100 rpm to



5000 rpm, consists of two units. The pick-up unit, a miniature six pole alternator with a permanent magnet rotor, is mounted on the shaft of which the speed is to be measured. The indicator, a permanent magnet, moving coil type, then meters the pick-up output on a 3¾" scale. The high resistance of the indicator is such that the size or length of the leads will not affect its accuracy in performance. Neither do other magnetic materials nor duration of service affect it. Instantaneous and continuous speed indication is possible, independently of the direction of rotation. There are stationary pick-up windings and no commutators or slip rings. Conduits are not required, while life-time lubrication further simplifies maintenance. In the indicator's physical design, flexibility of use has been given special attention. Fool-proof shaft coupling has been provided, and the indicator may be bracket or panel mounted. Indicators are provided for full scale deflection corresponding to 1500, 2000, 2500, 3000 and 5000 rpm, and special scales are available.

INFORM-A-GRAM KEY No. D7-W

Your Clamping Problems

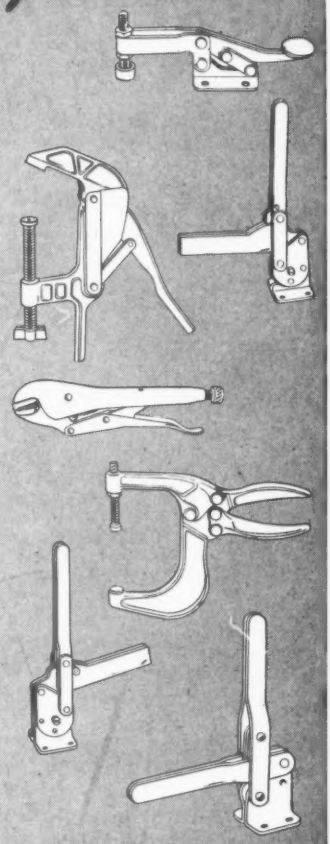
CAN BE SOLVED

by

KNU-VISE

. . . Specialists in the field of clamping devices

- **TOGGLE CLAMPS**
- **"C" CLAMPS**
- **PLIERS**
- **VISE WRENCHES**



Here at Knu-Vise you will find a most comprehensive range of standard clamping devices—clamps, pliers, vise wrenches—ready for immediate delivery. However, if your production involves a different clamping application, we'll gladly develop a special clamp to meet your needs.

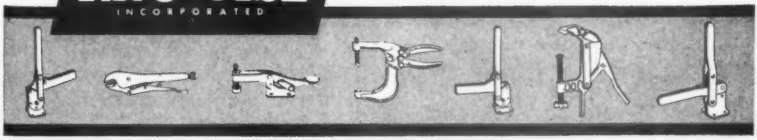
Remember, all Knu-Vise clamping devices can be gripped in an instant and released just as speedily—because of their unique toggle-action.

The accompanying illustration shows only a few of the models—send for a complete catalog—just off the press.

BUY WAR BONDS

KNU-VISE
INCORPORATED

1330 PLUM ST. DETROIT 16, MICH.
4328 SAN FERNANDO RD. GLENDALE, CALIF.

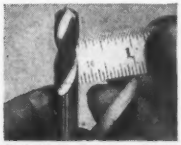


A TOOL KIT IN ONE TOOL!

Illustration is Model No. 4 with a ¼" shank, 2⅛" to 4" expansion capacity and ¾" thickness capacity.... $25.00

One Clark Adjustable Hole Cutter Replaces a Whole Tool Kit of Fixed Radius Cutters.

You have a tool crib at your elbow when you're using Clark Cutters. Gives a smooth finish the first time without filing or de-burring in steel, hard fibre, plastics, wood and other materials. Models cover variable expansions from ¾" to 5" holes and have thickness capacities from thin sheets to 1".



Clark Hole Cutter is simple to adjust, yet performs more efficiently than fixed radius cutter of same size.

In portable electric drill, Clark Hole Cutter easily cuts steel plate as well as pipe, plastics, hard fibre, Transite, etc.

Write for complete catalog TDJ-3-HC and call your Clark Cutter Jobber today.

CLARK CUTTERS

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD BEVERLY HILLS, CALIFORNIA

Turchan Follower Eliminates Cams

The Turchan Follower Hydraulic Attachment announced by The Turchan Follower Machine Co., Dept. J, Detroit, Michigan, can be used for high pressure milling, eliminating need for the use of expensive cams formerly required for this operation. Well known to production men is the fact that when forms are milled under heavy pressure, using

hardened cams and rollers, the cams need frequent replacement as they change in shape and wear out. Now, by the use of a Turchan Hydraulic Follower Attachment, expensive cams can be replaced by soft, inexpensive templates, often saving thousands of dollars on a quantity production job. Typical in example is the 16-foot wing spar shown herewith, being machined on a special spar miller, one of the largest milling machines used in an airplane plant. The shape of the spar is being reproduced as pictured in the lower, small illustration. By the old method of this operation, such terrific pressure was exerted on the cam and roller that they had to be replaced at frequent intervals.

INFORM-A-GRAM KEY No. 104-W

If it's a small part

. . . turn it with Precision, Speed and Profit on a

SHELDON LATHE

Model S-56
10" Precision Lathe

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. (The lathe selected by U. S. Army, the Navy and the Marine Corp., for mechanized machine shop instrument repair shops, etc.)

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- Bronze or anti-friction bearings
- "1" Collet capacity
- 11¼-inch plus swing
- Double-walled apron
- Large hardened and ground spindle
- Extreme accuracy
- Convenient controls
- Underneath V-belt motor drive
- All steel bench

All SHELDON lead screws are cut on the finest Pratt & Whitney "Super-precision" lead screw machine.

Builders of Good Lathes Since 1919

SHELDON MACHINE CO., Inc., 4236 N. Knox Ave., Chicago 41, U.S.A.

PRODUCE MORE AT LOWER COST!

Production goes up—and stays up—when Barker Wrenchless Chucks go on the job. These chucks are simple, rugged, self contained units, that require no accessories, or outside source of power.

They are easy to install, and from the moment they are put in use they will deliver speedy, trouble-free service that pays liberal dividends—greater number of parts per hour, and lower cost per unit.

Precision built, they will hold to a tolerance of 1/1000" either way on round stock of uniform size. And, they will maintain such accuracy during many years of hard service.

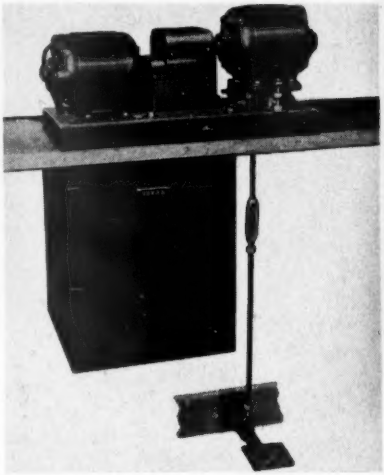
Barker Wrenchless Chucks are made in two-jaw and three-jaw types; and as vises for milling machines, drill presses, and similar purposes.

For complete information write for Bulletin No. 201.

THOMAS HOIST CO.
Chuck Division
20 So. Hoyne Ave., Chicago 12, Ill.

Two Motor Brush Type Wire Stripper

An inexpensive Wire Stripper for cleaning cotton and enamel, silk and enamel, string asbestos and similar types of light insulation is announced by the Ideal Commutator Dresser Co., Dept. TD, Sycamore, Illinois. The machine handles round, flat or rectangular wire, solid or stranded, of any length. Especially suited for cleaning fine "Litz", "Formex" and "Formvar" wire and fibre glass insulation. Two wire cleaning



brushes are positively driven, being mounted directly on ends of separate motor shafts. Useful life of brushes is increased through their not being in contact, save when in use, because the right-hand motor, mounted on a pivoted base, is normally held up by a spring. For stripping, wire is inserted in opening and pressure is exerted on foot pedal. This brings the upper brush down against wire and the lower brush. Between the two rapidly turning brushes, the wire is quickly cleaned. Foot pedal action may be eliminated by setting brushes to diameter of wire. As sections of the brushes, made of special steel wire ground to size, become worn, they are replaceable, thus effecting longer brush life and maximum economy. Strippings, dust and dirt are removed by a motor-driven dust collector.

INFORM-A-GRAM KEY No. 329-W

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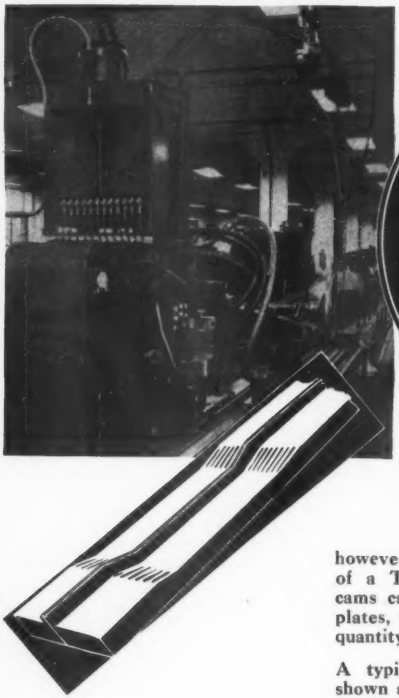

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THE SCLEROSCOPE FOR MEASURING HARDNESS OF METALS, published by The Shore Instrument Co., Inc., Dept. D, Jamaica, N. Y., is a completely descriptive text. Concerning hardness testing, even the non-technical man, using this reference, can grasp hitherto abstruse matter and can use judgment never before made possible even for technical graduates. Use of the scleroscope is demonstrated in testing highly hardened steel, dead soft metals, very thin pieces, masses of unlimited size, finished surfaces without visible injury, odd surfaces like gear teeth, cams, tools, etc. In operation, the gage's advantages are its reliability in hands of non-technical help, its easy portability and the speed and ease with which it can be read. Purchase of raw and finished material to scleroscope specifications is fully explained. Chapters acquaint the reader with the properties, characteristics, and uses of carbon tool and high speed steels; hardness and cutting; relation of hardness to other physical properties; hardness standards adopted by automotive engineers; cementation and case hardening; and springs. Included is a complete description of the operation and mechanism of the Scleroscope Model C-2.
INFORM-A-GRAM KEY No. 126-W

HOT WORK TOOL STEELS (Bulletin No. 6 Revised) is mainly composed of tables of recommended steel compositions, heat treatments and hardnesses for specifically listed dies and tools. Tools listed are those for hot working steel and iron, hot working aluminum, zinc, brass and tools for hot forging shells. The preface treats such related subjects as requirements of hot work tools, influence of design, importance of mechanical set up, adequate preheating, cooling, influence of die and tool lubrication and quenching. An extremely useful and explicit booklet for all those engaged in manufacture of dies and tools. Address Crucible Steel Co. of America, Dept. J, 405 Lexington Ave., New York 17, N. Y.
INFORM-A-GRAM KEY No. 256-W

SHORT CENTER LEATHER BELT DRIVE DATA (Third Edition). Published by American Leather Belting Assn., Dept. T, 41 Park Row, New York 7, N. Y., is a complete and explicit help for all who use short center pivoted leather belt drives. Not only does it illustrate the advantages and efficiency to be gained by use of these belts; it has belt selection tables for 3" to 30" motor pulleys. To assure users of satisfactory drives, there are directions for determining the right pulley diameters and, in relation to them, the selection of belt widths and thicknesses. There is special information about figuring belt widths for electric motor drives. There are tables for computing costs of belts from 1" to 24" in thickness, ranging in lengths from 1" to 600". Instructions for installation and operation of pivoted motor driven bases are included. There are 24 pages illustrating the many uses of these pivoted leather belt drives in a score of different industries. Of special interest to those already using these motors and belts are timely suggestions for means of getting maximum performance and production as well as endurance from these leather belts.
INFORM-A-GRAM KEY No. D3-W

LUBRICATING INSTRUCTIONS AND SPECIFICATIONS for Cincinnati Milling, Grinding, Broaching and Lapping Machines (Revision of booklet No. M-1084-2) should prove more effective than before in reducing maintenance expense through correct lubrication. Modern machine tools, with their many hydraulic and lubricating features, must be serviced with specific grades and types of oil. Only when those responsible for lubricating shop equipment are thoroughly informed, can this be accomplished. With the exception of the lubricant specification numbers, the instructions and the corresponding machine diagrams are self-explanatory. Lubricant specifications conforming to the various specification numbers are grouped on one page. Information includes the selection of an oil, periodic filling

methods for reservoirs, oil cups, grease nipples, etc. Cleaning of reservoirs, filters and strainers is explained. Address Cincinnati Milling and Grinding Machines, Inc., Dept. T, Cincinnati 9, Ohio.
INFORM-A-GRAM KEY No. 233.5-W

SAE LEAF SPRING MANUAL. "Manual on Design and Application of Leaf Springs," prepared for the U. S. Army Ordnance Department by the War Engineering Board of the Society of Automotive Engineers, has been made available for use by industry.

The manual, comprising 89 pages, presents 44 figures, four tables, and numerous detailed calculations, and includes data on materials, surface finishes, design elements and calculations, interleaf friction, protective coatings, and manufacturing conditions. Three pages are devoted to nomenclature and specifications, five pages to requirements, drawings and specifications.

Purpose of the manual is to facilitate calculation of space requirements for springs and attachments, determination of elastic and geometric properties. It was prepared under direction of the WEB Leaf Spring Committee, of which Tore Franzen, Chrysler Corp., Detroit, is Chairman, by a Leaf Spring Sub-Committee composed of 16 engineers representing vehicle and spring manufacturers and suppliers aided by seven military consultants.

Copies are available to SAE members at $1 each, to non-members at $2 each, postpaid, from SAE Special Publications Dept., 29 West 39th St., New York 18, N. Y.

SILVER ALLOY BRAZING. Production speed and perfection are paramount with the Chemical Warfare Service. An article entitled "Silver Alloy Brazing" by Col. Harry R. Lebkicher, Commanding Officer, Chicago Chemical Warfare Procurement District, shows, step by step, with photographic illustrations, the methods and materials used in silver alloy brazing in the Chemical Warfare Service. Among the products described in detail are the M-15 hand grenade and the flame thrower. Others noted are the gas mask and the incendiary bomb. The article offers detailed explanations of the CWS procedure and preparation for low melting silver alloy brazing in large conveyorized and continuous production lines. Methods of cleaning and heating, and other operations are covered in full. Production rates are given. The properties and advantages of low temperature silver alloy brazing are reviewed. Manufacturers expecting to include low temperature silver alloy brazing in their post-war assembly methods can obtain copies of this article from Handy & Harman, Dept. TD, 82 Fulton St., New York 7, N. Y.
INFORM-A-GRAM KEY No. 310.5-W

NEW HOLDEN NEUTRAL BATH FOLDER, a revised and enlarged 32-page edition of the Holden Neutral Bath Folder No. 120, contains information on the use of neutral baths for hardening and tempering. It also includes data on Holden "Flow Heat Treatment" and the new Speed Nitriding Process. Explains use of this equipment for tempering and annealing high speed steel, for hardening tool steel, for heat treating SAE 1030, 4600, and

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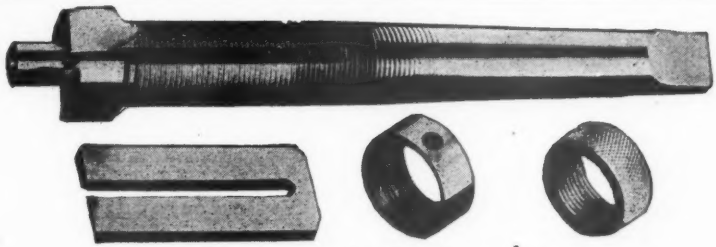

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This folder is available from the A. F. HOLDEN CO., Dept. TD, New Haven 8, Conn. *INFORM-A-GRAM KEY No. 150-W*

DIAMOND TOOLS, by Paul Brodzinski, Technical Consultant: Industrial Diamond Review, London, England, is the only textbook on the use of diamond tools that has been published in this country. It will fill a very definite need in automotive, aircraft engine plants and other metal-working plants that require extreme precision machining operations. Plastic and rubber also may be efficiently and economically machined with diamond tools. The author gives a very comprehensive analysis of the diamond production and trade; use of the diamond as an industrial material and diamonds with other precious stones as applied in bearings and for wear resistance. Superior quality of the diamond is shown in such precision operations as hardness testing, the truing and dressing of grinding wheels, and the drawing of fine wires through diamond dies. Extensive treatment is given the use and selection of the diamond in wheel truing as influenced by the condition of service, the peculiarities of the various tools and the desired results. Other operations wherein diamonds must necessarily be used are the machining of glass, natural and artificial stone, and rock drilling with diamond boring crowns. Diamonds are used for engraving tools and in powdered form as an abrasive. In the portions devoted to the use of the diamond as a precision cutting tool detailed and factual treatment covers the cutting process, chip formation, the geometry of the cutting point, machining methods, speeds and feeds, fastening and setting of diamonds, tool design, tool support, special tools and applications, surface finish considerations and the care of diamond tools. Besides giving the reader very graphic descriptions of actual machining operations as performed with diamond tools, the volume is well compiled with footnotes, explanatory drawings, photographs, tables of measurement and bibliographical references. Published by Anton Smit & Co., 333 West 52nd St., New York 19, N. Y. Priced at $4.50 per copy.

MANUAL OF MACHINE SHOP PRACTICE, by Otis Benedict, Jr., Assistant Professor, Department of Shop Practice, Pratt Institute, School of Science and Technology, Brooklyn, N. Y. A wealth of essential material usually

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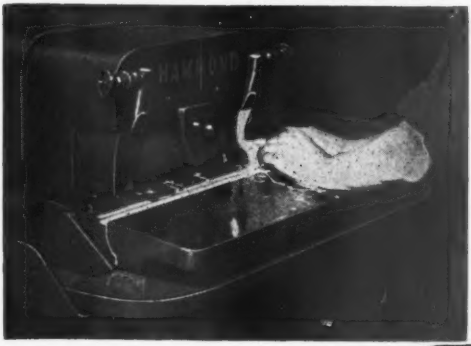

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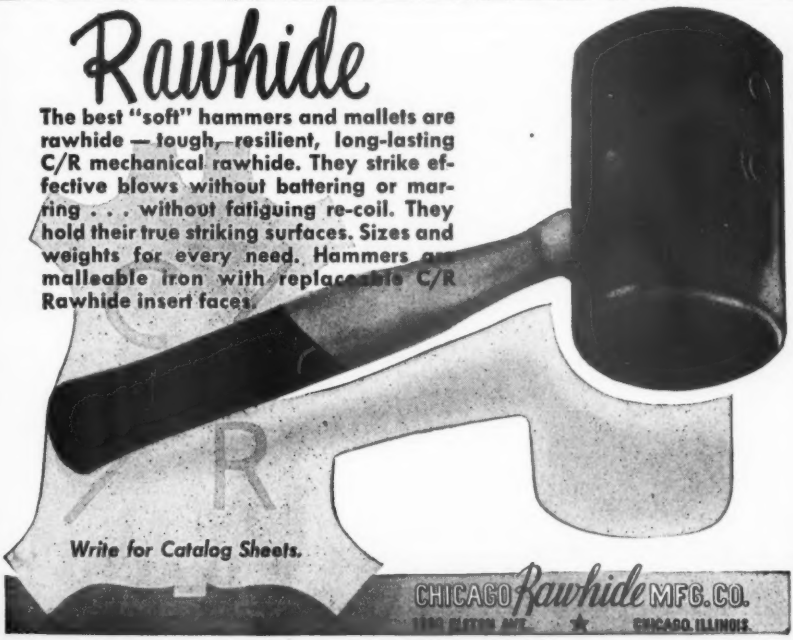

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PRACTICAL METALLURGY FOR ENGINEERS, a publication of the Research Staff of E. F. Houghton & Co., is a compilation of the most valuable experiences of a corps of men, thoroughly trained in the fundamentals and theory of their profession and having the added advantage of many years of practical knowledge of application. The volume includes twenty-five chapters covering subjects from the physics and chemistry of metallurgy, descriptions of metals and their ores, through all necessary production steps for metals to the final procedures of testing and inspecting. Members of the Houghton Research Staff have for years been constantly called into consultation as "trouble shooters" in plants throughout the world. Thus their actual field experience is amazingly widespread and covers practically every type of plant condition. While the function of this book is to deal with fundamentals and established practices, it has also included data on those expedients which have been tentatively adopted so far in the war emergency. The section on new steels records metallurgical developments up to the time this book went to press in November, 1943. Included in the reference data are tables of standard steel compositions, test data on low alloy steels, temperature conversion, standard gages, weights and areas of square and round test bars, standard points for calibration of thermometers, weights and specific gravities, coefficients of linear expansion, physical constants of the alloy forming elements, specific heats and melting points, specific electrical resistance and other basic tables of measurement. This is the fourth edition of Practical Metallurgy for Engineers and will be well appreciated by readers of the earlier editions as well as newer students and engineers of metallurgy. The book is published by E. F. Houghton & Co., Philadelphia 33, Pa., and is priced at $3.00.

FLEXIBLE SHAFT HANDBOOK, 2nd Edition, makes available to engineers 256 pages of full and up-to-date information and engineering data covering flexible shafts and their applications. In aviation, automotive, radio, electronic machinery and many other fields, there are many new applications in use of the flexible shaft. Their line of flexible shafts has been greatly augmented by the S. S. White Co., working in cooperation with engineers of prospective users. To meet the requirements of military equipment such as planes, tanks, ordnance, naval, signal corps, and other de-

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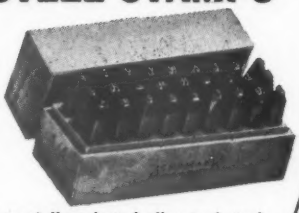

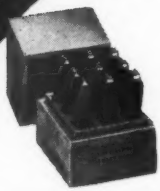

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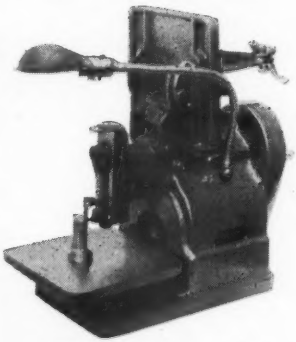

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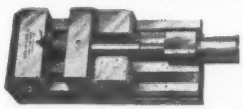

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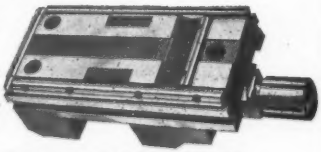

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partments in many cases special shafts, differing in characteristics from any others then available, had to be developed and standardized. Noteworthy among the new developments described are shafts specially designed and constructed to meet the specific requirements of mechanical remote control applications. This edition also includes information about "coupling," another field of flexible shaft application newly developed since the publication of the original Handbook. Although still in its infancy, coupling with flexible shafting is assured of wide adoption because in many places it can be employed to good advantage in product design. While no work of this kind can cover every case and condition, the company offers fullest cooperation in answering any and all questions from engineers and designers concerning any specific problem involving the use of flexible shafts.

Requests for this handbook must be made on the writer's letterhead and must indicate his title or position. Address The S. S. White Dental Mfg. Co., Industrial Div., 10 East 40th St., New York 16, N. Y.
INFORM-A-GRAM KEY No. D4-W

ARC and ACETYLENE WELDING, Basic Procedures, by Harry Kerwin, formerly of California Polytechnic School, San Luis Obispo, California, stresses special welding techniques to assist the operator in mastering the actual manipulative techniques before he advances to the welding of alloy metals and the intelligent study and application of construction and joint design as applied to welding. Practical methods are given for controlling expansion and contraction, low heat brazing, alloy welding and pattern layouts. A non-technical book concerning the practical side of welding. The student welder, by study of this text, can shorten his training period, eliminate hours of practice spent on wrong procedures and can learn how to identify as well as to make a good weld. Published by McGraw-Hill Book Company, Inc., 330 W. 42nd St., New York 18, N. Y., and priced at $2.50.

A TREATISE ON PLANERS, published by the Cincinnati Planer Co., has been prepared to aid those interested in and confronted with the problems of one of the most interesting branches of machine building—the producing of flat surfaces quickly and accurately. It is intended to help those called upon to select the proper machines for accomplishing this result and to aid the experienced journeyman in the proper jigging up and use of the correct tools to produce the work at a minimum cost. Special effort has been made to treat planing in a clear and comprehensive manner, carefully avoiding all unnecessary matter and presenting to the apprentice and mechanic many points pertaining to the tools and fixtures with which they come in daily contact

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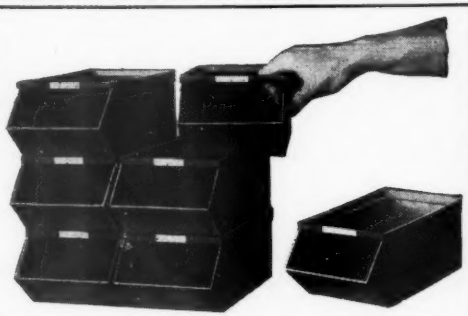

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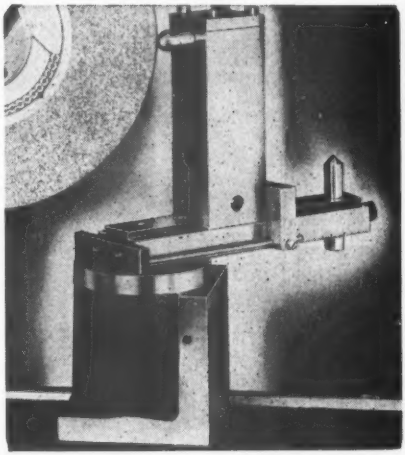

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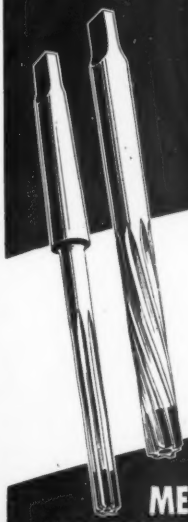

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and about which they are often unable to obtain all necessary information in order that they may use planers and planing tools correctly and efficiently. Available from the Cincinnati Planer Co., 3120 Forrer, Cincinnati, Ohio, at a nominal charge of $1.00.

INDUSTRIAL RESEARCH by F. Russell Bichowsky is intended to display the social importance of research and to outline those general principles of management and organization which have proven successful in the laboratory. The discovery and manufacture of new products to sell is the one possible source of wealth left us, the author believes, to replace the wealth lost in war. As this new source of wealth must originate in the laboratory, industrial research is thus a matter of extreme social and national importance. Even the most hard-headed business and banking executives are beginning to see this. With nothing to start with less than fifty years ago, there are now over two thousand industrial laboratories spending over a quarter billion dollars annually on research which has become a sizable industry all by itself. In concrete form this book presents what may be thought of as a philosophy or theory of research in its social aspects. A manual for the research director and the business executive. Published by the Chemical Publishing Co., Inc., Brooklyn, N. Y., and priced at $2.50.

PRACTICAL PHYSICS, edited by Marsh W. White, Ph. D., and prepared under direction of the Division of Arts and Science Extension of Pennsylvania State College, was prepared in response to the wartime need for a concise textbook in general physics at the introductory level. Emergency conditions brought streamlined courses with shortened hours, special service groups and adult training programs, all demanding practical and condensed physics courses. Therefore this book's emphasis is placed on those parts of physics that are basic to practical use in engineering, war industry, technical work and the armed services. In this book the simplest algebra and trigonometric functions of a right triangle are the extent of the mathematics used. Its design to utilize in a logically progressive manner the required simple mathematical material is a distinctive part of the book's plan. This enables a student to study and review the mathematics concurrently with the physics. To achieve this integration of mathematics and physics the order of topics in the book is somewhat unusual, with heat and fluid physics preceding the mechanics of solids. Another feature of the book is the inclusion at each chapter end of one or more experiments to illustrate the topics considered in the chapter. These experiments utilize simple and readily available apparatus. The text material has been tried out in more than 400 classes, and constructive criticisms have been made by

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Piston Detail

ACCURATE REPEATING

ACCURATE REPEATING of length in bar stock work is assured by the Newton Bar Feed. Rejects are reduced; production stepped up.

Your airline connects to the pressure Regulator which delivers the desired pressure to the far end of the stock tube and actuates the Piston which pushes the stock into the lathe and against the stop under uniform pressure. Thus, length rejections caused by the variations of pressure inherent in mechanical and hand-feeding of stock are eliminated.

Noiseless stock feeding is accomplished by the Newton Bar Feed. The forward end of the Piston, mounted on end-thrust ball-bearings and of inverted cone shape, centers the stock and turns with it, thereby holding it away from the feeder tube.

Piston rings of carbon-impregnated Neoprene rubber seldom require renewal in order to retain satisfactory air pressure in the feeder tube. Replacement cost is very low.

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Pressure regulator in full sight of the operator at all times, is quickly adjusted for various stock weights. Only a small amount of line pressure is necessary for stock feed. For example: 4 lbs. pressure feeds ¼" diameter x 8 ft. stock.

Made in 6 sizes to accommodate bar lengths from 6 ft. to 12 ft., the Newton Bar Feed is priced from

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Price includes Pressure Regulator, Stands, Piston. Everything is complete, ready for use.

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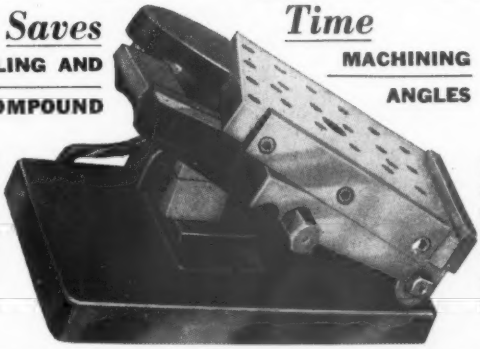

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Substitute the actual values

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D = .750168 inch.

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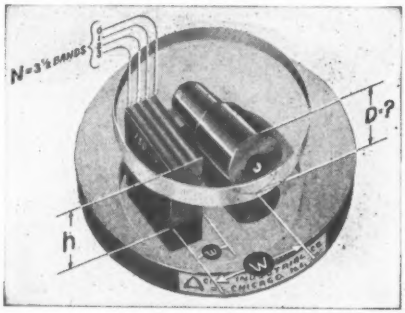

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many of the 200 instructors, of college and high schools, and professional engineers who have used the preliminary editions. Published by McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y., and priced at $3.25.

ELECTRON-OPTICS, by Dr. Paul Hatschek, is a textbook on the fundamentals of electronics, written in plain language and without mathematics. By attractive and ingenious methods of comparison, the author has linked to a well known subject an unknown one to make it understandable. Fundamentals of this science are presented in such simplified form that its mysteries are revealed to those having no previous acquaintance with the subject. Wonders already achieved by this remarkable science that is so quickly transforming our world are herein explained to the reader and he is given the broad groundwork necessary for understanding new and rapid developments. Although at the time this book was written, in 1935-36, the science of electron-optics was in its infancy, still it had made possible the building of a number of remarkable devices. Examples are television apparatus and rebuilding and improving such well known devices as amplifying tubes. An excellent textbook for anyone interested in electron-optics, television and professional photography.

Published by the American Photographic Publishing Company, 353 Newbury St., Boston 15, Mass., and priced at $3.00.

ENGINEERING DATA ON CINCINNATI MILLING MACHINES. Tool engineers, plant lay-out men and methods engineers can make good use of a new book entitled "Engineering Data" prepared by the Cincinnati Milling Machine Co., Dept. J, Cincinnati, Ohio.

Indicative of the contents of this manual is the following: longitudinal and rotary table feeds, general specifications and dimensional drawings for vertical milling machines, plain and universal milling machines, plain and universal dial type, vertical dial type, plain and universal high power milling machines, vertical and horizontal hydro-tel milling machines. The same information is also given for their plain automatic milling machine, automatic rise and fall milling machine, plain and duplex hydromatic milling machines, plain tracer controlled and duplex tracer controlled milling machines, tracer controlled hydromatic, four spindle 360° automatic profiling machine, No. 2 cutter and tool grinder, monoset cutter and tool grinders, single ram and duplex vertical hydro-broach machines, circular milling attachments, index bases and plain and swivel vises.

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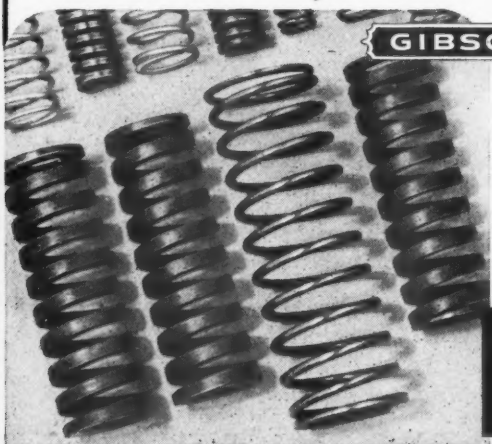

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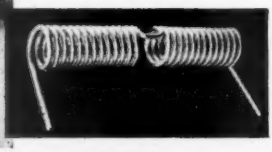

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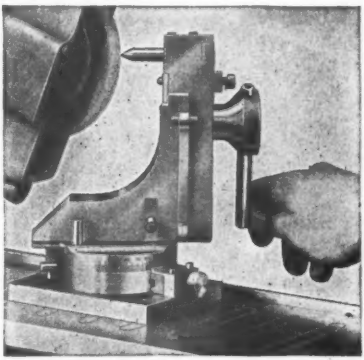

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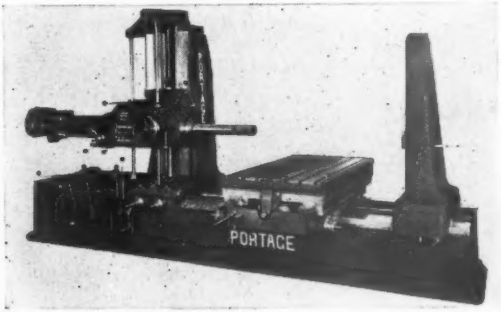

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scales catalogue type, "Engineering Data" is available free of charge to engineers interested in this information.
INFORM-A-GRAM KEY No. 233-W

MANUAL ON THREAD-MILLING CUTTER SHARPENING. A handy pocket size, 16-page, 2-color, technical manual (Bulletin HT-43) compiled to enable faster, more accurate sharpening of thread-milling cutters, gear hobs, etc., has been made available by Detroit Tap and Tool Co., Dept. TJ, 8432 Butler Ave., Detroit 11, Mich.

Included in such a manual for the first time are tables of equivalent Offset Distances for all Angles of Rake from 1° to 25°, in 1° steps, and for all sizes of cutters between ⅜ inch and 7 inch O.D., in $\frac{1}{16}$ inch steps. Offset distances for special angles and other diameter cutters can be computed from a formula, with example, given.

Many helpful suggestions on set-up, grinding, hook, lead and flute spacing checking, and the prevention of run-out and other errors in the sharpening of thread-milling cutters are included. Corrections of thread form and pitch diameter errors are facilitated by a section on factors affecting thread form accuracy.
INFORM-A-GRAM KEY No. 134-W

HOW TO RUN A LATHE. The South Bend Lathe Works has just issued the 43rd edition of their popular book, "How To Run A Lathe." A number of changes in text material and illustrations have been made since the previous edition was printed in 1942.

This book contains the latest information on the operation and care of metal working lathes. It covers such subjects as the operation of the lathe units, grinding cutter bits, making accurate measurements, plain turning, chuck work, taper turning, boring, drilling,

reaming, tapping, cutting screw threads, reference tables, etc. Written clearly and concisely, it is widely used by machinists and as a shop text in school and apprentice training courses. This edition contains 128 pages, 5⅛" x 8", and over 365 illustrations. Postpaid copies are available with paper covers for 25c or with leatherette covers for 75c in stamps. Write to South Bend Lathe Works, Dept. TD, 391 E. Madison St., South Bend 22, Ind.

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are of heavy, rigid stress-proof construction for smoother work finish.
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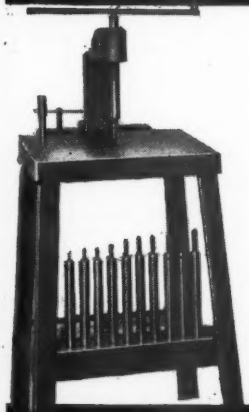

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No set-up required — quicker, simpler operation — less spoilage with greater all-round tool room accuracy in tapping, drilling, grinding or jig-boring.

Every tool room should have this combination write for descriptive literature.

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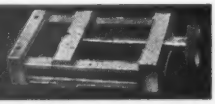

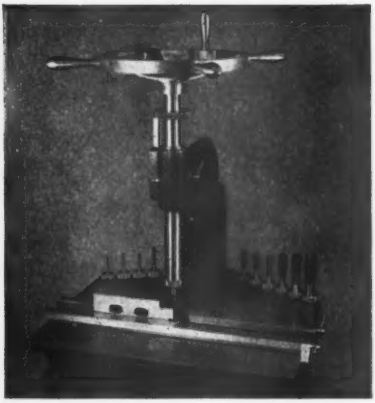

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be subjected to close visual inspection. The motion of objects moving at irregular speeds may also be stopped with this instrument. Since the light source is mounted in a small probe at the end of a 5-foot flexible cable, small objects may be easily viewed at close range. Provision is made to operate the unit from external tuning fork or crystal standards where extreme accuracy is required. An accurate repetitive pulse rate is obtained, as the pulses are derived from a stable audio oscillator. This not only eliminates need of constant readjustment of the repetitive rate, but it also insures clearly defined images at high speeds. A control switch for adjusting light intensity is also provided for greater flexibility. This makes it possible for the user to control both the intensity of the light and the duration of the pulse length.

INFORM-A-GRAM KEY No. D9-W

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The fifth Army-Navy "E" award has been made to The H. M. Harper Company, 2620 Fletcher Street, Chicago. At first thought it seems a far cry from non-ferrous and stainless bolt and nut products, such as Harper makes, to planes, tanks and guns. Yet these fastenings play a vital part in a complex variety of war equipment.

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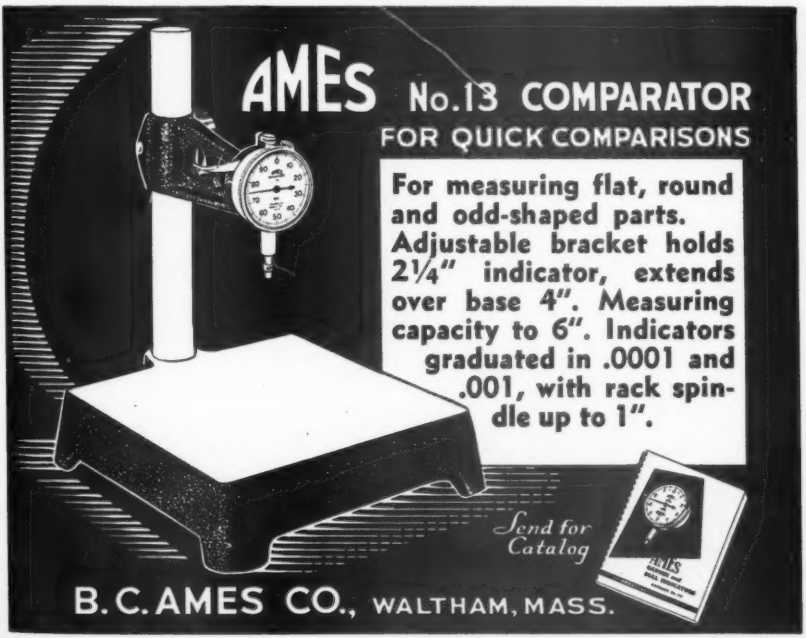

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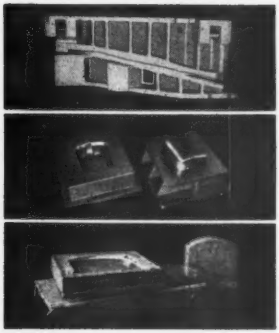

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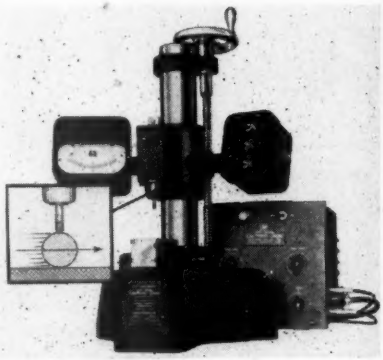

gages, and other types of specal gages. It is provided with both limit lights and indicator dial for initial setting and for selecting or directly measuring work pieces. For rapid inspection, any one of the three lights—green for okays, yellow for undersize and red for oversize—tells instantly the status of a dimension. Setting the gage is accomplished by manipulating the radio type controls while observing the dial. The contact point is located manually by means of the lead screw. The gaging head can be swung 180 degrees in either direction around the column. On the dial are two scales, the upper graduated 1-0-1 and the lower graduated 3-0-3. The smallest divisions of each scale are equal to either .0001" or .00001". Gaging contact pressure is adjustable to suit requirements of from 1½ ounces to 16 ounces. Accuracy of the mechanism is affected less than 1% by voltage fluctuations of plus or minus 10 volts.

INFORM-A-GRAM KEY No. 4-W

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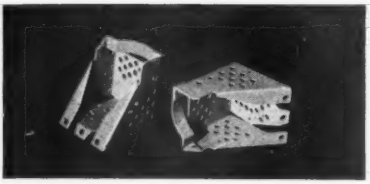

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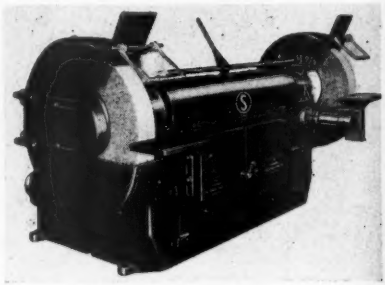
30″ Snagging Grinder

No. 75 is the model number of the new Heavy Duty Double End Snagging Grinder produced by the Standard Electrical Tool Co., Dept. T, Mt. Hope and Sixth St., Cincinnati 4, Ohio. This machine tool has four speeds of 1200, 1375, 1675 and 1950 rpm to maintain 9500 sfm on the two 30″ x 5″ resinoid bond wheels.



The drive is supplied by transmission of power through a multiple V-belt. These belts may be conveniently renewed by means of the shaft coupling. This grinder's 30 hp ball-bearing motor is adjusted by an integral ratchet wrench for placing tension on the V-belt drive. A built-in ratchet wrench, supplying rack and pinion movement, conveniently adjusts the boiler plate steel guards to wheel wear. The conveniently included equipment consists of eye shields and heavy duty work rests measuring 6″ x 11″. There are adequate wheel flanges of 15″ diameters for 12″ bore wheels. The overall spindle length is 92″ with a spindle height of 33½″. The machine's base measures 42″ by 75″ and it weighs 5460 pounds. The moving parts are well shielded for safety in a neat, compact housing.

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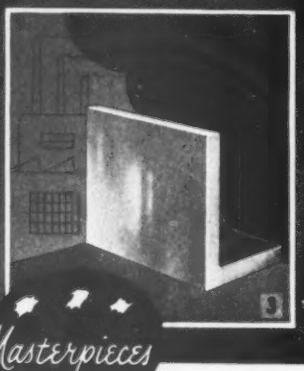

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★ Solid Parallels—14 sizes

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THE CHALLENCE MACHINERY CO.
GRAND HAVEN MICHIGAN

Pratt & Whitney, Division Niles-Bement-Pond Company in West Hartford, Conn., has just been given the Army-Navy "E" for the fifth time. Their original "E" award was presented by Lt. Gen. Wm. Knudsen in August 1942.

MILWAUKEE ATLAS

DIE FILER

Precision Built for Accurate Die Filing and Sawing.

Order from your nearest Machinery Dealer or Direct.

Immediate Delivery.

Complete with motor and saw attachment at

$125.00

f. o. b. Milwaukee

Manufactured by

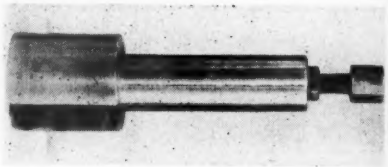
Milwaukee

CHAPLET & MANUFACTURING CO.

1023 S. 40th ST., MILWAUKEE 4, WIS.

Quick Change Tool Holder

A new type of Tool Holder, a product of the Precision Instrument Mfg. Co., Dept. T, 2403 W. Carson St., Pittsburgh, Pa., is designed to permit the quick changing of drills, taps, reamers, or boring bars in automatic screw machines



and in turret lathes. No special adjusting tools are needed in this procedure. This quick change tool holder greatly resembles in appearance the standard models that have been heretofore in common use. Tools may be sharpened time after time yet continue to be usable in the same holder for maintaining the same depth of cut. The holder is provided with a conventional oil line fitting for feeding a coolant through standard hollow tools. The tool is held to the correct depth by an adjustable bolt and lock nut at the rear of the holder. The quick change tool holder is manufactured in all standard sizes and is also made to special orders.

INFORM-A-GRAM KEY No. D12-W

★

Tenth for a Goodyear Tire & Rubber Company plant or subsidiary since Pearl Harbor, an Army-Navy "E" award for production excellence was recently presented to the Goodyear Clearwater Mills at Atco, Ga.

The presentation was made by Major General Harry F. Hazlett, commanding general of the Headquarters Replacement and School Command, Birmingham, Ala.

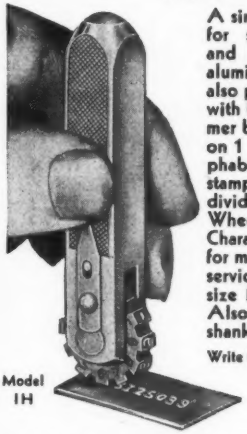
Others who took part in the program included E. J. Thomas, Goodyear president; Clifton Slusser, Goodyear vice-president in charge of production; S. A. Steere, general manager of Goodyear's fabrics division, and Guy I. Parmenter, plant superintendent.

Since Pearl Harbor, Goodyear's plant at Atco has been a major producer of cotton, rayon and nylon fabrics for tires, bullet-seal fuel cells and other purposes.

NUMBERALL

ROTARY STAMP

Patented



Model 1H

A single wheel Stamp for stamping figures and letters on brass, aluminum or soft steel; also plastic and wood, with but a single hammer blow. All figures on 1 wheel, entire alphabet on 2. One stamp replaces 12 individual, hand stamps. Wheel of tool steel. Characters, engraved for maximum stamping service, furnished any size from 1/16" to 3/8". Also supplied with shank for press.

Write for Bulletin TD-1H.

IMPROVED TYPE HOLDERS

For Stamping into Metal, etc.

Hand or Press Style.

Super Quality Steel Type.

Type is easily, quickly, loaded and unloaded. Simplest construction. A pin holds the type securely. No screws nor springs. Made in various sizes: 1/32" to 1/2" figures and letters.

Write for Literature TD23H

Model 23H

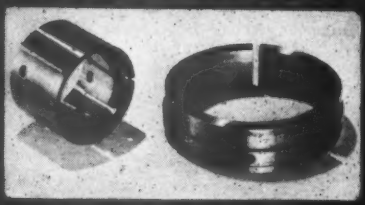
STEEL TYPE

We also make numbering machines . . . automatic and non-automatic . . . for stamping, either hot or cold, numbers and letters into various materials.

NUMBERALL STAMP & TOOL CO.

HUGUENOT PARK STATEN ISLAND 12, N. Y.

MAKE WORK HOLDERS



OF TOOL STEEL TUBING

The piece at the left above is an expansion work holder, and the one at the right is a three-piece collet bushing, both made of tool steel tubing. Either piece, bored from a solid bar of tool steel, would have cost twice as much to make. BISCO tubing saves time, money, manpower and metal.

WRITE NOW!

Learn how to use tool steel tubing in YOUR plant. This free booklet is yours for the asking.

IMMEDIATE SHIPMENT FROM STOCK

N.E. Steels and Standard S.A.E. Steels, both Carbon and Alloy, Hot Rolled and Cold Drawn • Chisel Steels • Cumberland Ground Shafts • Drill Rod • High Speed Steels • Shim Steels • Tool Steels.

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THE BISSETT STEEL CO.

945 EAST 67th ST., CLEVELAND 8, OHIO

NEW Angle Adaptor

Converts any drill press into a versatile multi-purpose machine.

Permits any spindle angle . . . at any height . . . horizontally or vertically.

Simplifies clumsy operations . . . speeds production . . . eliminates operator fatigue.

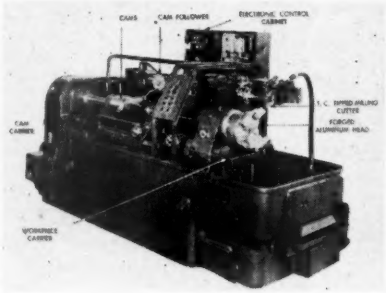
Makes burring, sanding, buffing, grinding, angle drilling, polishing, rotary filing, wire brushing, tapping, reaming, honing, etc., more convenient, twice as fast!

Adaptable to all drill presses with tubular columns . . . rigid construction . . . POSITIVE LOCKING. Write now for descriptive literature, details.

NOBUR MANUFACTURING CO.
908 North Orange Drive
Los Angeles 38, California

Sundstrand Automatic Milling Machine

The Sundstrand Automatic Milling Machine, announced by the Sundstrand Machine Tool Co., Dept. T, Rockford, Illinois, is an interesting example of the combined use of electronic and hydraulic control. It was designed especially for the milling of fins on a forged aluminum airplane cylinder head. Milling



the same number of fins formerly requiring four machines and operations is accomplished with this machine in two operations. Circular and partial fins are milled at one time. The handling of dome fins requires a change in cams, the cutter and the work holder. The cutter feed, varying from 6" to 60" sfm, is automatically adjusted to depth of cut and power consumption. The irregular path of the cutter is controlled by a set of cams, one for each fin. The cutter head and cam follower roller are both mounted on a single casting, pivoting on widely spaced bearings. This provides the cutter head with a direct cam control. To eliminate chances of error between rotation of the cams and rotation of the part, the master cams and work part are mounted on one splined shaft. An electrically controlled, mechanical feed box rotates the work through its feed and rapid traverse cycle. The unique feature of this machine is its ability to perform a completely automatic and highly complicated series of operations. Adjustments are positive and the cutter can be set to rapid approach to within ⅛" of each fin. The machine can be used with either individual or a central coolant system.

INFORM-A-GRAM KEY No. 36-W

Kalamazoo METAL CUTTING BAND SAW

TWO SIZES
8" x 16"
8" x 24"

◆

Ask Your Dealer or Send for Bulletin

Continuous Production and Low Cost on **CUT-OFF WORK**

A modern, high speed, low cost production unit for cutting off rods, bars, tubes or odd shapes to lengths. Extremely accurate. Narrow kerf saves costly metal. Labor saving automatic operation. No heat generation. Long life for saws.

Coolant attachment is compact and has no messy floor pans. Portable and plugs in anywhere. Casters optional.

Machine can be furnished without coolant for intermittent cutting.

MACHINE TOOL DIVISION KALAMAZOO TANK & SILO CO. KALAMAZOO, MICHIGAN

The KNURLED Head SAVES TIME—

UNBRAKO

Reg. U. S. Pat. Off.

SOCKET CAP SCREW

Mechanics prefer it because the knurling of the head prevents time-wasting finger-slip and lost motion. Oily fingers become geared to the knurled head, enabling the screw to be turned farther by hand before a wrench is needed. These savings really mount up. Sizes from No. 4 to 1½" diameter. Full range of lengths.

Send for the "Unbrako" Catalog

OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 600

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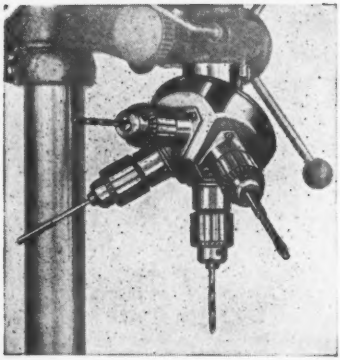
THE NEW
QUADRILL
TURRET ATTACHMENT FOR DRILL PRESSES!



4 DRILL PRESSES IN 1

- Rigid Alignment — Strictly Accurate
- Easily Attaches to Quill of Press
- Quick Indexing
- Finger-Tip Control Changes Positions

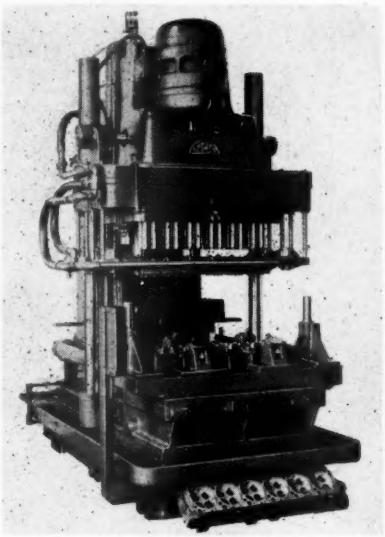
Multiply drill press production 4 times with the new QUADRILL. Attaches directly to the quill of most drill presses. Three drills remain stationary for safety while only drill in work position operates. Actually converts a single drill press into four. Does away with moving work from press to press and reduces frequent changes of tools. Saves floor space. All this and more. Write for complete details and prices today.

Sold on Positive Money-Back Guarantee

CHICAGO
DRILLET
CORPORATION
919 N. MICHIGAN AVE.,
CHICAGO 11, ILLINOIS

Drilling and Reaming

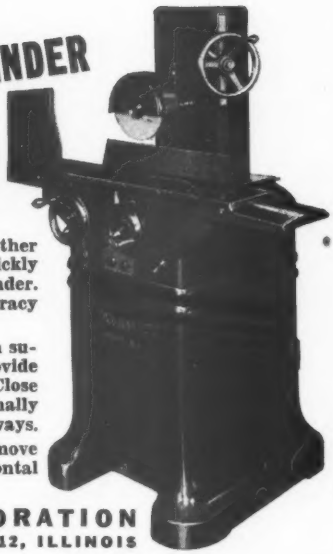
A special purpose machine for drilling and reaming aircraft cylinder heads has been developed by the Snyder Tool & Engineering Co., Dept. J, 3400 E. Lafayette Ave., Detroit, 7, Mich. In one operation the machine drills and reams 24 holes in an aircraft cylinder head. The machine consists of a Snyder standard 20-V-16 drilling machine column installed upon a special base and a special multiple head mounting bracket. The bracket carries a 48-spindle multiple drilling head and two 24-hole bushing plates. All the spindles are mounted in ball bearings. At start of work cycle, two hydraulic cylinders placed horizontally on the sides of the column move the fixture to its first position. A pin positions the fixture and slide accurately. The work head is automatically released and goes through its operation cycle consisting of rapid advance, downward feed and rapid return. An emergency return button can retract tools from the work, while fixture automatically returns to loading position.



INFORM-A-GRAM KEY No. 466-W

BOYAR-SCHULTZ NEW 618 SURFACE GRINDER

TOOL ROOM PRECISION



Gage grinding, tool and die work and any other work requiring close precision grinding is quickly accomplished with this sturdy Surface Grinder. It is built to maintain a high degree of accuracy through long continuous use.

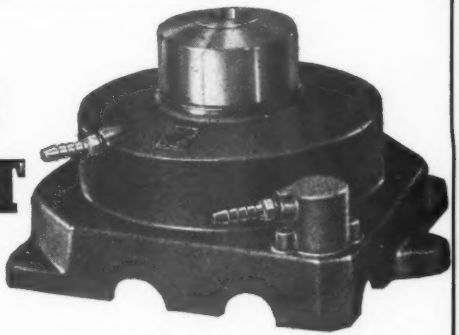
Dynamically balanced spindle equipped with super-precision, pre-loaded ball bearings provide smooth and quiet operation at 3,000 R. P. M. Close grained Meehanite table moves longitudinally only, and on hardened and ground tool steel ways.

New, improved cross feed is designed to move the abrasive across the work in a true horizontal plane giving maximum accuracy.

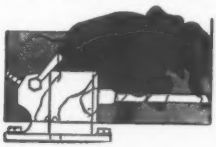
BOYAR-SCHULTZ CORPORATION
2112 WALNUT STREET CHICAGO 12, ILLINOIS

Announcing

MEAD AIR COLLET FIXTURES



These new high production precision fixtures open up new vistas in the field of second operation work. Their accuracy will meet the most rigid requirements; their fast action leaves nothing to be desired; their compactness does not waste a fractional inch. They will hold a 1″ bar so firmly that a strong man cannot turn it with a 12″ pipe wrench, yet in conjunction with a suitable pressure reducer they will gently handle the most delicate of precision parts as low as $\frac{1}{16}$″ in diameter. Automatic ejection of finished work.

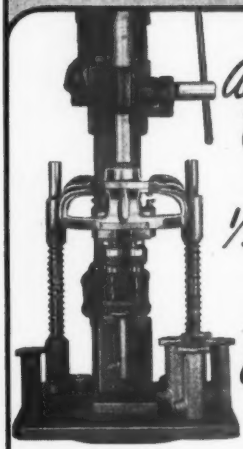


MEAD SPECIALTIES COMPANY
4114 North Knox Ave., Dept. HA-345, Chicago 41, Ill.

Write for new Mead Air Power Catalog

TWO SPINDLE *Adjustable* DRILL HEADS

Drill Two Holes At Once



✓ *Adjustable Centers from 1/2" to 6"*

✓ *Drill Capacity 0" to 5/8"*

Sleeve and overarm types ... in several sizes. Will double output of any single spindle drill press.

Quickly adjusted to desired drill centers from 1/2" to 6".

Send for bulletin

LINDERME

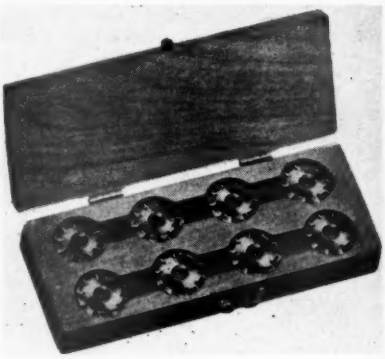
MACHINE & TOOL CO., INC.

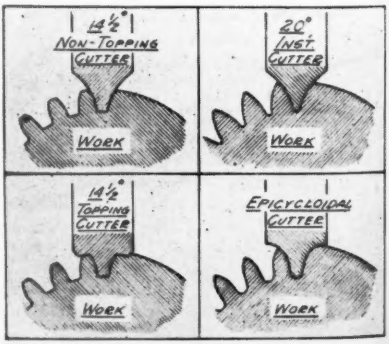
12250 COYLE AVENUE
DETROIT 27, MICHIGAN

Fine Pitch Gear Cutters

The Truform Cutter Company, Dept. T, 3224 Drew St., Los Angeles 41, California, is offering a line of small fine pitch gear cutters, especially useful to a shop or laboratory engaged in experimental or small lot production and instrument work. These cutters regularly have a ¾" OD and ¼" arbor holes. The line of stock includes 48, 64, 80, and 96 diameter pitches and pressure angle of 14½ degrees. They can be supplied in either carbon or HS steel. A set consists of eight range cutters, in a hardwood box, to cut gears from 12 teeth to rack in any of above pitches. A special cutter in any pitch finer than 48 can be made to order. Twenty degree instrument type gear cutters and epicycloidal cutters can be supplied in a reasonably short time.

INFORM-A-GRAM KEY No. D10-W





Phone, Wire or Write Us if You Want . . . . .

PROMPT DELIVERY of

THREAD PLUG GAUGES

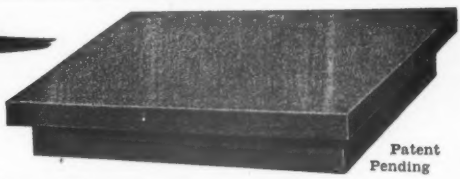
GAUGES DIES JIGS FIXTURES

MASTER GAUGE CO.

2218 FENKELL AVENUE, DETROIT 21, MICHIGAN Phone: University 3-7676

Test

HERMAN GRANITE SURFACE PLATES



Patent Pending

ACCURACY at Our Expense

Herman Granite Precision Surface Plates are cut from blocks of granite. Their accuracy to 1/10,000 inch is made possible by millions of years of natural aging that makes them warp proof. Unaffected by ordinary temperatures, rust or corrosion, they are practically indestructible; yet they cost no more than ordinary cast iron surface plates.

Herman Granite Surface Plates save their original cost many times over in economy of "Joe blocks" and height gauges. The hard, smooth, non-magnetic surface does not become charged with filings and emery dust. Easy cleaning, without need of demagnetizing, saves time, speeds production.

Mail your request for literature and prices —or ask for a specific date for a test in your own shop at our expense.

Nationally Known Users of HERMAN Granite Surface Plates

Westinghouse Electric
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General Electric
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The Herman Stone Co.

Business Office, Harries Bldg., Dayton 2, Ohio

BURKE
MILLING MACHINES

No. 4 Motor Driven MILLING MACHINE
Mounted on Cabinet Column

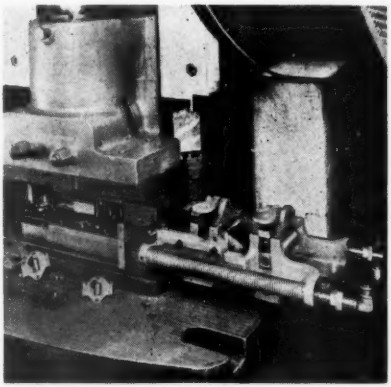
Burke motor driven milling machines Nos. 1, 2, 3, and 4 are specially suited for handling small, difficult work on a production basis.

Write for complete information.

Burke Machine Tool Co.
301 E. 16th St. -:- Conneaut, Ohio

Dickerman Die Feed

The Dickerman Die Feed, produced by the H. E. Dickerman Mfg. Co., Dept. J, 321 Albany St., Springfield, Mass., is of particular interest for its improved stock release levers and the much faster gripping cylinder release for starting new coils. This die feed becomes automatic in operation, reducing to a minimum the chances of human error and results in a saving of materials as well as labor costs. This feed can be installed on almost any type punch press and can be placed on the die set in any position of conformity to the style of the die. Only three screws are required in mounting this feed to the die set, thus making the installation a very simple process. A twin operating cam is furnished for attaching to the punch holder. The feed requires no connection to the power shaft of the press, hence the required die set and the feed may be set up on any idle press. It can be adjusted from 0" to its maximum feed length in increments of .001". Savings on installation time can be realized by leaving this die feed permanently attached to dies that are often used. This feed is designed to handle coiled stock of any practical thickness and any width up to 4". The accurate feed control equips the die to handle stock of any grade in finish. The important main springs are made of oval wire for compactness and low fiber stress.



INFORM-A-GRAM KEY No. 270-W

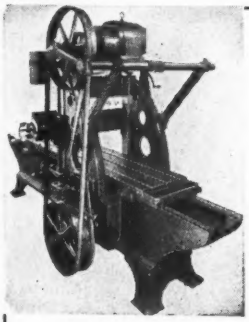
WE DELIVER THE GOODS!

TOGGLE CLAMPS

TOGGLE CLAMPS now available from stock. All popular models. Made of cold drawn steel parts and sufficiently flexible to withstand abuses far beyond normal safety factor. One free bolt retainer with each toggle clamp. Send us your order.

DIE SUPPLY COMPANY

4751 Hough Avenue Cleveland 3, Ohio EXpress 1133



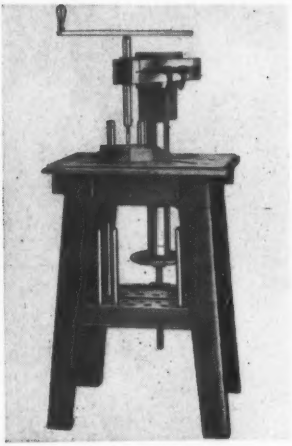
MASTERDRIVES for PLANERS Eliminate Lineshafting

Now you can have added flexibility in plant layout, because Masterdrive eliminates lineshafting and permits placing planers wherever you wish.

The drive is supported by four supports. Each of these require the drilling and tapping of four holes. Once supports and horizontal bars are in place, motor base and outboard bearing support can be moved laterally to line up with pulleys. Your present ceiling lineshaft pulleys are used on the motor counter shaft. A single complete installation with Masterdrive—one responsibility. Write today for details of planer or other Masterdrive applications.

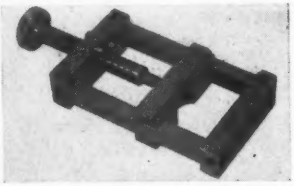
THE MASTER ELECTRIC CO.
INDUSTRIAL EQUIPMENT DIVISION · DAYTON, OHIO

2 Producto Tools



1. PRODUCTO
UNIVERSAL HAND TAPPER

This recently developed machine insures accurately tapped holes and prevents tap breakage. No setting up required. Holes can be tapped or reamed in any position on table, using tap sizes from No. 5 to 1" diameter.



2. PRODUCTO
PRECISION TOOL ROOM VISE

Handy, lightweight, large opening capacity—a precision tool for jig borers, surface grinders and accurate tool room purposes. All parts hardened, surfaces and jaws ground at right angles and parallel. Sturdy, tight gripping, fast adjustment.

Send for details

THE PRODUCTO MACHINE COMPANY
BRIDGEPORT 1, CONNECTICUT
BRANCHES: Detroit, Indianapolis, New York City

Two Diamond Wheels in One

Industrial Abrasives, Inc., 3724 West 38 St., Chicago 32, Illinois, manufacturers of diamond grinding wheels, diamond tools and diamond powder, have developed a dual purpose, super-cut, zurium bonded diamond wheel comprising two diamond wheels in one, for rough grinding and fine finishing of cutting tools. The manufacturer states this is

the first time that it has been possible to make such diamond wheels and that they are manufactured under their exclusive process of securely locking diamonds in the matrix, layer upon layer. Of the two separate grinding surfaces, the outer (7 degree) beveled surface contains layers of coarse diamonds whereas the inner flat surface is built up of fine 400 mesh diamonds. The following advantages are claimed: By merely "angling" the side or point of a carbide tool, it can be rough ground and superfine finished in a few seconds without the operator having to shift his working position. Better tool grinding results and tools stay sharper longer by being fine-finish ground. Dual, super-cut, zurium bonded grinding wheels encourage better tool grinding and there is less tendency to force dull tools to the limit, which requires extra resharpening (because of faster break down) to bring them back to the proper cutting condition. Additional information can be obtained from the manufacturer or by use of our postage free

INFORM-A-GRAM KEY No. 330-W

8 Speeds.. QUICK CHANGEOVER

FOR SMALL JOBS IN BUSY TOOLROOMS

FEATURES

- Choice of 8 speeds from 275 to 4250 r.p.m.
- Velvet feed with direct micrometer setting.
- Counterbalanced quill to remove backlash during travel.
- Grease-sealed bearings for smooth operation.
- Table size 7"x17½"; floor area 18½"x20".
- Table Top to spindle end 11½".

SEND FOR COPY OF DETAILED BULLETIN

The Linley vertical high speed Milling and Jig Boring machine is most useful for die work, models, metal patterns, fixtures and the many small toolroom jobs that too often are scheduled wastefully on larger machines. It's a profit maker in any shop . . . a precision machine in all respects.

If you have 2½ square feet of floor space to spare, that's the spot for this all-round utility equipment that will quickly pay for itself in saving both man hours and shop worries.

LINLEY

BROTHERS COMPANY
662 STATE STREET EXTENSION
BRIDGEPORT 1, CONN.

FOR MEASURING

FLATNESS

in "tenths" or "millionths"

ALL YOU NEED IS AN

Acme Monochromatic Lamp and an Acme Optical Flat

Valve illustrated at left, will not leak under pressure because inspection shows it to be FLAT within 3½ bands (40 millionths). The bands appear when you simply lay the optical flat on a highly finished work surface and view by the light of the Acme Monochromatic Lamp. **No skill is needed — Anyone can do it.**

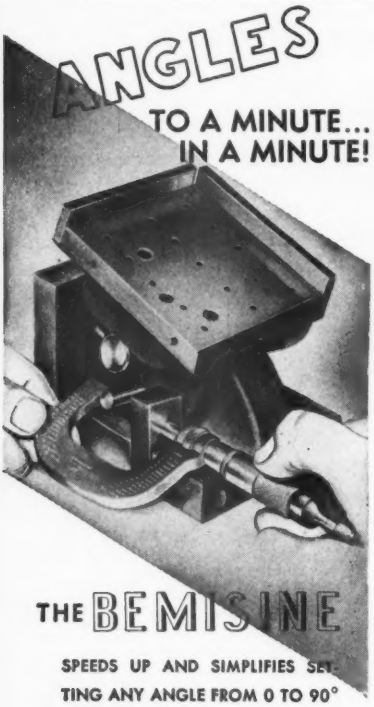
Send sample and state flatness tolerance. We will immediately quote suitable lamp and optical flat.

Send for free booklet, Shop Measurements with Light Waves

ACME SCIENTIFIC

DIVISION OF ACME INDUSTRIAL COMPANY
Makers of Standardized Jig and Fixture Bushings
206 N. LAFLIN ST., CHICAGO 7, ILL.
MONroe 4122

Another Army-Navy "E" star for Chain Belt Company of Milwaukee! Chain Belt Company has produced since 1941 medium size howitzers, pack howitzers, 120 millimeter anti-air craft guns, field guns, refuse grinders for transports and landing barges, tank turrets, gun shields, etc.



SPEEDS UP AND SIMPLIFIES SETTING ANY ANGLE FROM 0 TO 90° —USING ONLY A 2" MICROMETER!* IT HOLDS THE WORK! FASTER THAN A SINE BAR OR PROTRACTOR! CONVERTS SET-UP TIME TO PRODUCTION TIME ON SURFACE GRINDERS, JIG BORERS AND MILLERS.

*Also Used With Standard Gage Blocks

NICHOLS-MORRIS CORPORATION
44 CHURCH STREET, NEW YORK 7, N.Y.

Sheffield Piston Ring Inspector

The Electronic Piston Ring Inspector, designed by the Sheffield Corporation, Dept. D, Dayton 1, Ohio, automatically inspects the trueness of periphery and the width of gap of piston rings. The piston ring is inserted inside a correctly dimensioned master ring placed on the instrument table and is rotated by a

power drive. The gaging is performed by scanning beams of light directed on to photo-electric cells which energize electronic circuits controlling three signal lights. As the ring revolves, one beam of light is projected on the periphery of the piston ring. Between this and the master ring, any out-of-round condition will result in a clearance which permits part of the light to fall on a photo-cell. This cell is set to actuate a red rejection signal should excessive light indicate the piston ring is out-of-round beyond acceptance. If the entire periphery is within tolerance limits, and if the width of the gap is also within its tolerance, a green signal light will flash at the end of one complete revolution. The first light beam is interrupted by a mechanical shutter at the time the gap passes this point, and another beam of light actuates a yellow signal in the event of an undersize gap and a red signal for an oversize gap. Trueness of periphery can be determined within a .0001" limit. The inspection cycle per piece is under 5 seconds.

INFORM-A-GRAM KEY No. 24-W

C-F POSITIONERS

Production Welding will be automatic— on C-F Positioners

Wartime advancement in *automatic* welding makes certain its wide use as a standard production method in postwar manufacturing. As now, much of it will be done on C-F Positioners, because: (1st) They permit a down hand weld on all sides with but one set-up, rotate 360°, tilt to 135° beyond horizontal under push button control. (2nd) The exclusive C-F variable-speed drive which will give table rotational speeds from 0 r.p.m. up. (3rd) C-F Positioners come in sizes and capacities for every weldment—are universal tools equally efficient for job work or the production line.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.
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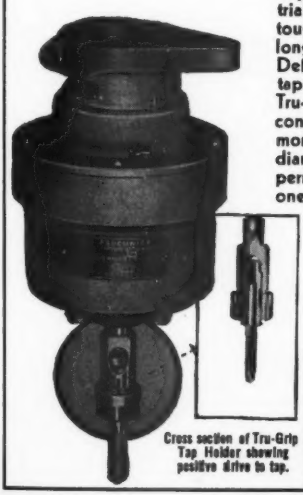
"This Tapping Head Came Out First"



Cross section of Tru-Grip Tap Holder showing positive drive to tap.

Says a production man in one of this country's largest industrial plants: "We tested competitive tapping heads on our toughest production lines—and Procunier came out first by a long margin . . ."

Definite superiority in design is the reason. This means less tap breakage, increased output—and more accurate work. The Tru-Grip Holder, for instance, weighs one-third as much as conventional chucks, which kills flywheel effect and promotes more accurate tapping. The tap holders have small outside diameter: ¾" for No. 1, 1" for No. 2, 1⅜" for No. 3—which permits use of tapping head in hard-to-get-at spots. Shank is one piece, heat treated and precision ground. Tap is driven by square and held true by the round. Many other features include: Dry, double-cone friction clutch that won't wear and can't absorb oil; makes bottom tapping easy; ball bearings; three point balanced, heat-treated gear reversing mechanism which distributes pull and greatly reduces strain.

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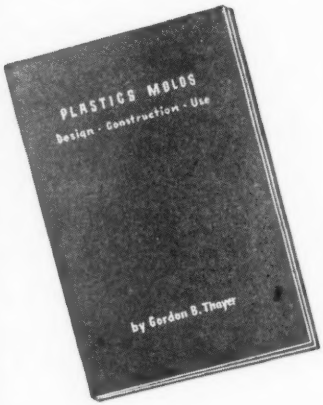
Second Edition

By Gordon B. Thayer



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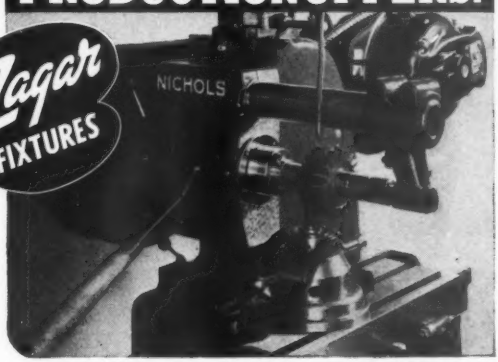

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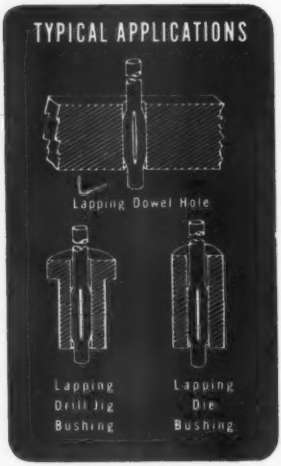

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Jet Engines for AAF

The beginning of jet engine production on a volume schedule for AAF combat operations already is underway at the General Electric Company's second largest war-time plant at Syracuse, N. Y.

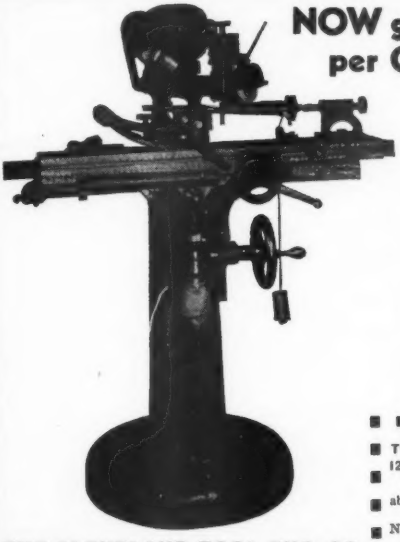
Completion of the first of the superpowerful G-E Jet engines recently at the Syracuse plant actually marked the beginning of mass production in the United States of this new motive power unit.

The entire plant at Syracuse, with its more than 600,000 square feet of floor space, has been converted to production of the G-E Jets, and the production need is considered so imperative that no time out for even a brief ceremony was taken when the first unit made there passed its final test and was delivered to the AAF.

Being the first company in the United States actually to get a volume production schedule started on the jet engines for aircraft conforms with other milestones in jet development. The jet engine was first developed in the United States for the AAF by General Electric engineers. Working then from a British design, the General Electric engineers made the first G-E Jet in the incredibly short period of six months. Further far-reaching advances in jet power development and control were made by these engineers and their accomplishments are incorporated in the G-E Jets now being produced at Syracuse.

The first G-E Jet was developed at River Works of General Electric Co., in Lynn, Mass., late in 1941 and early in 1942. The first propellerless jet-propelled plane to fly in the United States, the Bell P59-A Airocomet, was powered with two of those first models when it took off in October of 1942. Since then the development of the jet engines for the AAF has been concentrated at the works in Lynn, and numerous engines for experimental purposes have been made there.

Results of tests made with those G-E Jets convinced AAF commanders that these engines were needed in volume. The first contract for mass production of the G-E Jets went to General Electric, and conversion of the big plant at Syracuse, where turbine-electric power units for destroyer escorts had been produced, began several months ago.



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With this important device, grinds last three to five times longer before tools need to be re-ground. More metal is left to *more adequately* support cutting edges. Total output per tool is thereby greatly increased.

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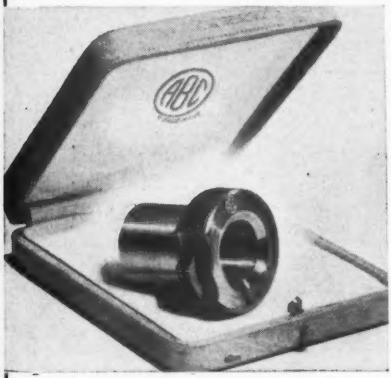

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Air Research Insures National Security

National existence now depends upon out-thinking enemies in the field of research at least by three years, the time-lapse between specification and production, Brigadier General F. O. Carrol says in the March SAE Journal.

The chief of the AAF Air Technical Service Command's Engineering Division reports that specifications for the Superfortresses now bombing Tokyo were prepared in 1939, and the intervening time was devoted to solving "some of the toughest research problems that our research men have ever faced."

Explaining that engineering dissatisfaction has become essential to greater accomplishment and that production of a plane makes it suspect for improvement, General Carroll asserts that "between ourselves and the aircraft industry we have the grandest bunch of dissatisfied engineers in the world today."

"Research momentum" has been created, with new developments coming in rapid succession and bigger and faster planes already on the drawing boards, General Carroll says, adding:

"What is good enough today will not be acceptable tomorrow. No matter what the disposition of aerial strength may be after the war; no matter how certain peace terms may seem to make future wars impossible; research which means preparedness must be continued. Research is our aviation insurance. We dare not let a single premium lapse."

★

New Field Engineering Office

The Cincinnati Milling Machine Co., and Cincinnati Grinders, Inc., are rendering a new service in the Baltimore and Washington, D.C., territories through their sales subsidiary, Cincinnati Milling and Grinding Machines, Inc., with an office located in the Washington Bldg., 15th and New York Aves., N.W., Washington, D. C.

E. Reiniger, factory specialist, technically trained and thoroughly experienced in milling, broaching, cutter sharpening, grinding and lapping methods, will be associated with C. W. Burgess, who is located in the Washington office. In addition, Mr. Reiniger will continue to serve as factory specialist in the Philadelphia territory.

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Measured by the number of times De-Sta-Co Spacers can be used, they are the lowest in cost of any spacers you can buy.

Made of metal, they are not affected by oil or heat.

Use for quick set-up of milling machine cutters and wherever low cost, accurate spacing is needed. Stock sizes .001" to .125" thick. Specials, any length, cut from bar stock, ground to decimal.

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Size and price list sent FREE!

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This multi-purpose unit is a top-rank expediter in such frequent uses as:

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2. Transferring dies to and from storage.
3. Serving as a variable-height die worktable.

It Pays Off in these Additional Ways:

Feeding sheets to shear or press . . . adjustable support for overhanging work . . . leveling work for easy transfer to and from work bench, heat treating furnaces, etc. . . . positioning by combined elevation and rotation of table top. *Delivery from stock* on table and optional accessories. Write for full details in Bulletin No. 133.

Delivery from stock on table and optional accessories.

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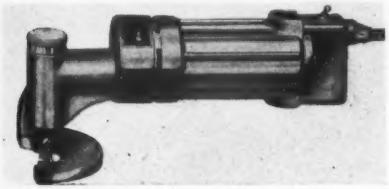
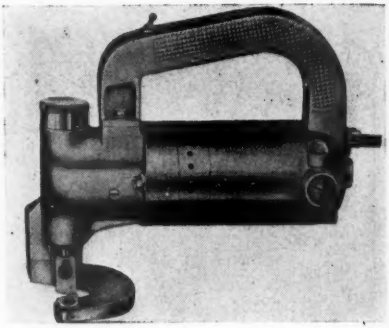
GES Electric Hand Shears

The GES-9 Electric Hand Shear, Nibbler Type, a product of Jefferson Engineering and Mfg. Co., Dept. J, 269 Walker St., Detroit, Mich., is a light weight (approximately 6 lbs) but powerful, fast cutter, capable of accurate,



straight or curved line cutting. It operates on AC or DC and may be specified for either 110 or 220 V, 25 to 60 cycles. A fuse protection incorporated in the switch box eliminates overload burn-outs and expensive repairs. The cutters are of alloy steel and are easy to resharpen and adjust. The ball bearing type universal motor of ⅛ hp provides ample power to cut 14 gage sheet steel at approximately



6½ fpm. The more powerful GES-12 has a ball bearing universal type motor of ⅙ hp and likewise operates on either AC or DC, and is available for either 110 or 220 V, 25 to 60 cycles. It also has the fuse protection incorporated in the handle. The cutting capacity is ⅛" in sheet steel at approximately 6½ fpm and it weighs 12 lbs. Both tools are strong and ruggedly built and are designed for perfect control and ease of operation.

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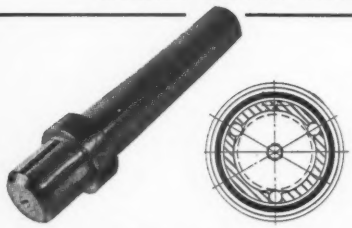

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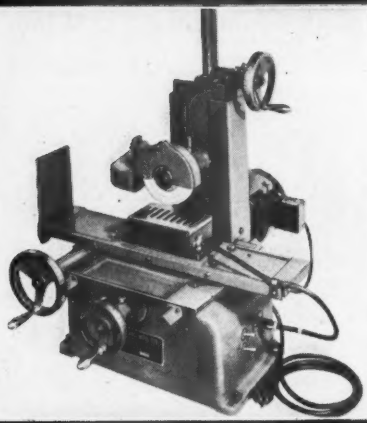

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Battelle Institute Expands Research Education Program

To help America maintain its top-flight position in science, an expansion of Battelle Memorial Institute's program of research education is being planned, Clyde Williams, Battelle director, has announced.

"America has been so busy in the last five years applying the old familiar laws of nature to military purposes that we have had too little time for discovering new scientific laws. Building new post-war industries and products for mass consumption depends on a steady flow of new basic knowledge. Futhermore, this new knowledge is vitally important for national preparedness in the future. Battelle's expanded plan of research education, built on fifteen years of experience in this field, is designed to add to the country's store of scientific knowledge, as well as to train young scientists," said Mr. Williams.

Thousands of veterans have become aware of the importance of technology from their battlefield experiences and will be interested in scientific or engineering careers. They are learning that scientific manpower is one of the country's key assets, and that the supply of such men is now, and will remain for years, critically short. Battelle Institute, in cooperation with other educational institutions, Williams declared, will give qualified veterans the finest possible training in scientific research on the professional level.

"Research education", said Williams, "is a familiar field for Battelle Memorial Institute. Hundreds of research men have been trained at Battelle, and many of these have carried its methods into the research laboratories of industry and into universities, government bureaus, and other scientific organizations throughout the country. The first Battelle fellowship was granted in 1930 and fellowships have been granted annually since that time. Another phase of Battelle's research education is the publication of the results of scientific research. These publications now total ten complete books, contributions in others, and more than 800 scientific papers and technical articles."

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BRIGHTBOY INDUSTRIAL DIVISION
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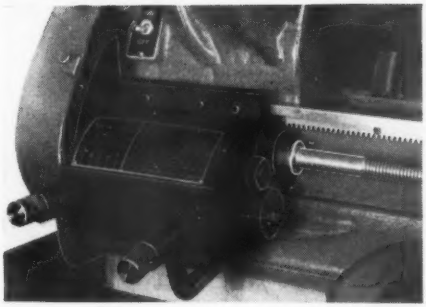

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NEW IMPROVED MODEL

Increases accuracy and is guaranteed to cut accurate threads from 4 to 224 per inch with approximately 3/1000 feed for fine turning. It is highly efficient and safeguards the entire product in process throughout the complete operation.

It cuts labor costs. Skilled operators are not essential as inexperienced men can easily produce top output. Easy to install. You simply drill and tap three holes.

Gear Box Housing made of High Grade Aluminum Alloy Casting — With replaceable bronze bearings — with gears of special quality hobbed alloy steel.

FOR LOGAN, POWERCRAFT, ATLAS, and CRAFTSMAN . . . $98.00

ALL SIZES LEAD SCREW . . . $12.00

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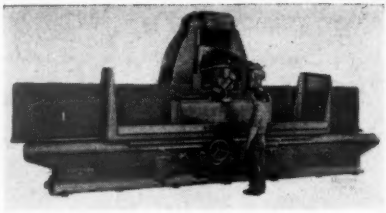
Mattison Precision Way Grinder

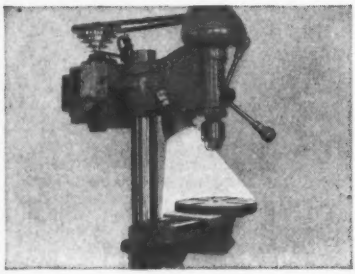


The Mattison Precision Vertical-Spindle Way Grinder, a product of the Mattison Machine Works, Dept. TD, Rockford, Illinois, is designed so that tables, slides, saddles, heads, turrets and other parts having angular machined ways or surfaces can be ground to a high accuracy and fine finish. Through the use of this machine, manufacturers are able to eliminate the costly hand scraping operation and can also finish parts having hardened ways. It also can be used for grinding flat parts where it is not necessary to remove an excess amount of stock. The accompanying sketches will give you a further idea as to the range of work that can be handled on the Mattison Precision Vertical-Spindle Way Grinder. The extra heavy base, cast as a single unit, is of rigid design and is heavily braced. The front part of the base supports the table on wide vee and flat ways. The table casting is also well ribbed and of substantial construction to eliminate any chance of distortion, even when handling heavy castings such as beds and slides.

The column castings are reinforced above by a heavy connecting brace, making the column support unit an integral part of the base. These columns, with wide bearing surfaces on their inside faces and dovetail bearing surfaces on the front and back of each column, provide an eight surface support for the vertical slide assembly.

The table on the Mattison Way Grinder is driven by a non-differential, twin cylinder, hydraulic drive, providing equal speed in either direction, fully cushioned smooth reversal, positive lon-

VIMCOLIGHT



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WYCO Flexible Shaft Machines have won national recognition for successful performance on the toughest jobs of war production . . . have set *new records* for longer shaft life and greater production per unit of power!

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Only WYCO Flexible Shafts have Patented Non-Metallic Innerliner —Makes the Core last longer . . . Run smoother . . . Transmit more power.

Wyzenbeek & Staff, Inc.
848 West Hubbard Street
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WYCO FLEXIBLE SHAFT EQUIPMENT and PROFIT PRODUCING TOOLS

SCHMIDT SOLDERING and OPEN FLAME TORCHES

Use artificial or natural gas or gasoline. Start without generating—"soldering heat in less than a minute." Schmidt "CONCEALED FLAME" Soldering Torches hold coppers steadily at any desired heat for continuous work. Very economical.

A moderate investment in Schmidt Equipment will step up production, reduce costs and increase profits. Send for circular.

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Open Flame
Work
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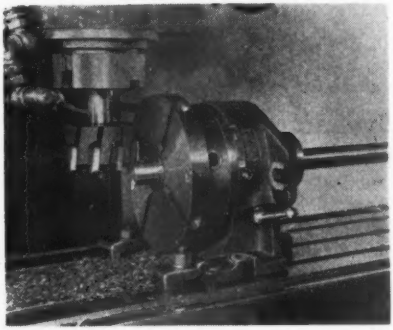
etc.

OPEN FLAME TORCH

MINN-KOTA Foundry & Mfg. Co., Dept. 805, Fargo, North Dakota



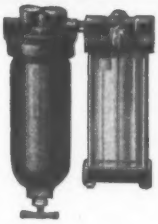
HARTFORD SUPER-SPACER

The adaptability of the Super-Spacer is illustrated here in milling bar stock. It is mounted with a draw-in collet and face plate combination. Many shops use their Super-Spacers to reduce or eliminate tricky setups and special fixtures. Many applications on a variety of operations are shown in Bulletin No. S-101.

THE HARTFORD SPECIAL MACHINERY CO.
281 HOMESTEAD AVE • HARTFORD, CONN.

M·B AIR-LINE FILTER and AUTOMATIC LUBRICATOR

Removes 96% to 97% of All Water, Dirt and Scale from Airline.



AIR passes through a series of brass discs with .002 spacings, providing the finest degree of filtration obtainable. Then as the air passes through head of Lubricator, oil is delivered into the purified airline in any desired volume. The scarcity of replacement parts makes the use of these devices doubly important.

A combination of this kind is only as efficient as the filter unit of the assembly.

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DIAMONDS for Production

Actual Size Photo
3 Carat Size—Common
⅞" Shank—$36.00 ea.

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Equip Now with "RE-SET-ABLE"
Diamond Tools on Your Precision Grinding Production Line

LOC-KEY-SET
by Patented Process
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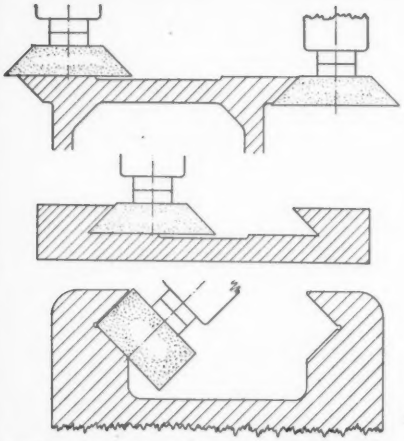
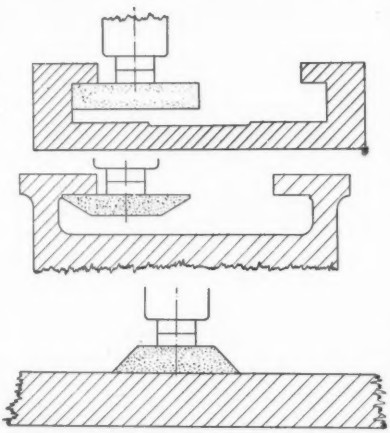
● **RE-SET-ABLE** adds to life of your diamond . . . More work per carat. Exclusive patented setting is tender to the diamond . . . Holds firmly . . . Protects from damage . . . Guards against breakage.
No. 24 CN RE-SET-ABLES are now selling in 100 lots. Ask for easy No. 4 Catalog and Grinder's Instruction Card. Shows sizes to fit your machines. Tools backed by service unequalled.

All diamonds are LOC-KEY-SET for immediate shipment . . . Tools numbered in units of ⅛ carat (No. 1 size) and lettered to denote quality of diamond and style of mounting . . . 3 grades — Common (C), Medium (M), Select (S). (24-hour resetting service $1.00 postpaid.) Bigger stones in C grade are genuine economy in diamond use. For large wheels we recommend **No. 60-CN.**

DIAMOND TOOL COMPANY, Not Inc. SHELDON M. BOOTH, Pres.
938 E. 41st Street · CHICAGO 15, Ill.

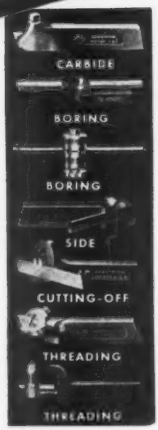




gitudinal travel of table and variable table speeds up to 100 fpm. Its simplified construction applies power direct and prevents chatter. It is easily controlled, exceptionally durable and highly efficient. The grinding head is mounted on a dovetail slide which is part of the vertical slide assembly. This slide is adjustable horizontally by hand, and is rapid traversed by motor drive. The head unit can be swiveled 60 degrees.

INFORM-A-GRAM KEY No. 384-W

ARMSTRONG
TOOL HOLDERS and TOOLS



STANDARD WHEREVER METAL IS MACHINED

Over 96% of the machine shops and tool rooms use ARMSTRONG TOOL HOLDERS, because each is a permanent, multi-purpose tool that does the work of a complete set of forged tools. Each is a stronger, more efficient tool that takes cutter bits quickly ground from stock shapes of high speed steel, thus "Saves: All Forging, 70% Grinding and 90% High Speed Steel."

With the Correct ARMSTRONG TOOL HOLDERS for each operation you will be permanently tooled-up for every operation on lathes, planers, slotters and shapers. They are sold by all leading industrial distributors.

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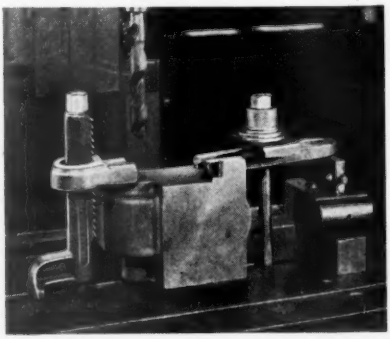
"The Tool Holder People"

340 N. Francisco Ave. Chicago 12, U.S.A.

Eastern Sales Office: 199 Lafayette St., N. Y. 12



TAKE A LOOK

THIS?——OR——THIS?

Clamping methods for holding work to the machine table have been improved. Howell adjustable high speed work clamps are practical in every sense of the word and needed in every machine shop.

Send for descriptive literature describing these unique clamps.

HOWELL CLAMP COMPANY

1373 East 95th St., Cleveland 6, Ohio

A SPEEDY SOLUTION TO YOUR MAN-POWER PROBLEM

PORTELVATOR (*Portable Elevating Table*)

Let man-power do other work . . . let this PORTELVATOR carry things . . . act as overhanging work bench . . . regular work bench . . . for lifting . . . for stock piles . . . for many "fetch and carry" jobs.

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THE HAMILTON TOOL CO.
Ninth and Hanover Streets.
HAMILTON OHIO

NEW

OPASKOPE

ALL-PURPOSE

Inspection Lamp

Extremely versatile, the new Opaskope Inspection Lamp not only illuminates objects placed on its stage, but its light can also be sent in any other direction. A friction swivel makes it adjustable to any height or angle.

The light delivered is cool — important when living or delicate tissues are observed. Its highly corrected spheric and aspheric lens combination produces a powerful, concentrated beam of light, free from chromatic aberration. Size of spot is controllable.

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- Deeper impression with less exertion.
- Any size character from 1/16" to 1".

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SAFETY STEEL STAMPS
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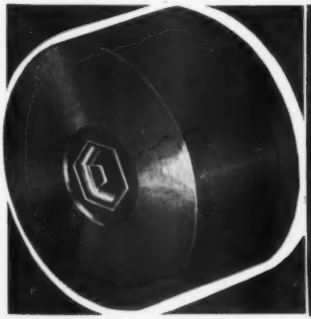

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TUNGSTEN CARBIDE

Special DIES *Shaped*

No need to worry about facilities for fast and reliable production of special-shaped dies—that's the specialty of the Hartley Wire Die Company.

Skilled workmen combined with extreme manufacturing care and most critical inspection assure you dies of the high quality you require, and the prompt service you desire.

"From blueprint to finished product"—that's Hartley service. Just send us the prints of the dies you require; no problem is too tough, no job too large or small. Every assistance we can give is yours.

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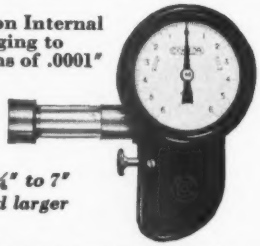
Plan a "MATCHED GAGING" Routine with

COMTORPLUG

Precision Internal Gaging to fractions of .0001"



Sizes: ¼" to 7" dia. and larger

Where production involves precision bores, use Comtorplug AT THE MACHINE, as well as for inspection, to increase output and decrease rejects. Unlike a limit gage, Comtorplug enables operator to detect IN THEIR EXACT AMOUNT off-size, out-of-round, front or back taper, etc.

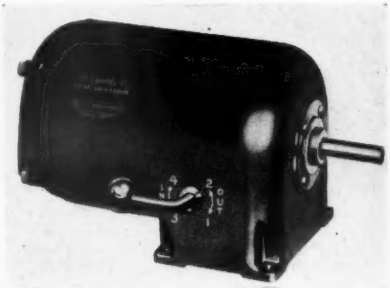
Request Bulletin 29

THE COMTOR CO.

82 Rumford Ave. Waltham, Mass.

Lima Selective 4-Speed Gearshift Drive

The Lima Electric Motor Company, Dept. TJ, 804 Findlay Rd., Lima, Ohio, announces a new addition to their Selective 4 Speed Machine Tool Gearshift Drive line. This unit is designed to power machine tools and other equipment requiring 1 hp or less. The unit is rated at ½ and ¾ hp at 1200 rpm and 1 hp at 1800 rpm. Simplicity of design and compactness are features which make for convenience in mounting where space is



limited. Weighing only 85 lbs, the unit has an overall length of only 18", including the shaft extension; the overall width, including terminal box and shifting lever, is 12", while the overall height is only 9". The new unit, identified as Type R, is designed for continuous operation with ample overload capacity. A Lima, semi-enclosed, drip-proof, ball bearing motor of either 2 or 3 phase, 50 or 60 cycle, 220, 440 or 550 volts is furnished as a standard integral part of this unit. Type R is reversible in all speeds with the use of a reversing drum control. Equipped with anti-friction bearings throughout; the shaft and all gears are of heat treated alloy steel, running in a bath of oil, which assures long life and trouble-free operation. With evenly distributed speed changes, the ratios of Type R are 1 to 1, 1.33 to 1, 2 to 1 and 4 to 1. Shifting is done by means of a small lever which can be extended to any convenient position as required. Because of its simple construction, the shifting mechanism is trouble-free and easy to operate.

INFORM-A-GRAM KEY No. 571-W

DUPLEX M-6
BAND AND DISC GRINDER

The latest in pedestal type grinders. Actually two machines in one! 14" disc for all rough work . . . 6 x 48" band for finishing. Precision-built to meet wartime production standards — quickly, economically!

Other styles and sizes in New Booklet on Finishing—Write Today

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Alloy Steels For Victory

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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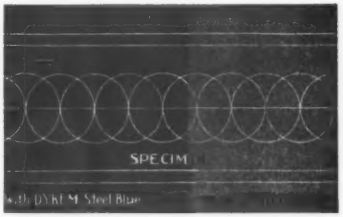

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STOPS LOSSES
making dies & templates

Simply brush on; ready for the layout in a few minutes. The dark blue background makes the layout lines show up in a sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

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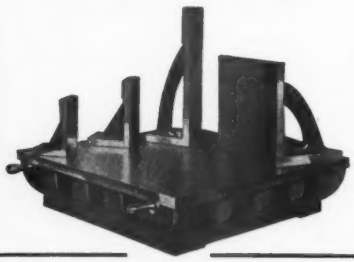
MILWAUKEE
Surface Plates



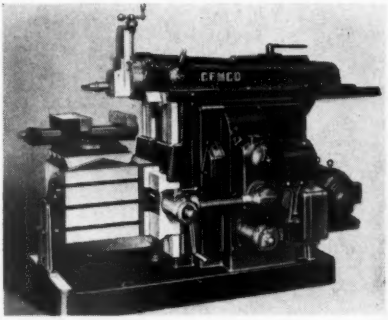
A full line of surface plates, angles and box parallels. Standard plate sizes from 8"x 8" to 48"x 96", larger sizes with or without legs. Plates are finish-planed and scraped to insure a very accurate surface.

Write for details

J. C. BUSCH CO.
Engineers & Machinists Since 1907
172 SO. FERRY ST., MILWAUKEE, WIS.

GEMCO Universal Shapers

GEMCO Universal Type Shapers, manufactured by General Engineering & Mfg. Co., Dept. T, St. Louis 4, Missouri, represent the latest development in the design and construction of crank type, 16" to 24", toolroom shapers. The shaper table consists of a tilting top which is supported by a trunnion integral with the apron. By means of a self-locking worm gear drive, the revolvable table may be angularly adjusted about this trunnion to any degree indicated on a



large graduated dial indented on the outer end of the trunnion. The trunnion on the 20" Heavy and 24" Standard shapers is supported at its outer end. The tilting table top may be tilted 15 degrees either side of zero by means of a worm gear drive, and is locked in rigid position by special clamping means. Tee slots are provided in the tilting and removable table tops. An exclusive feature with all GEMCO Multi-Purpose Shapers is the Lubrigard, an automatic safety device operating in conjunction with an automatic self-cleaning oil filter. The principal function of the Lubrigard is to prevent the main control lever of the machine from being brought into "running" position whenever the oil pressure in the lubricating system has dropped below a predetermined point. Other features of the GEMCO Universal Type Shaper are a twin helical bull gear drive, precision ground flat bearing surfaces, positive tool head lock, centralized controls, wide range of selective feeds and speeds, and an advance type of force feed lubrication.

INFORM-A-GRAM KEY No. 850-W

FISHER BENDER

A sturdy bender made of the best quality malleable iron castings with hardened steel bending blade.

CAPACITY { ½" square or round iron
2" x ½" channel iron
2¼" x 5/16 flat iron cold

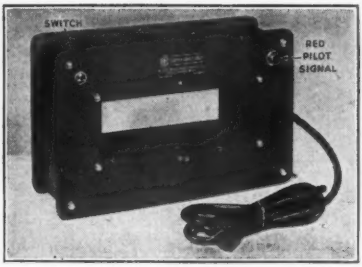
Hand Operated - - - Weight 40 lbs.

T. H. LEWTHWAITE MACHINE CO.

314 East 47th Street - New York 17, N. Y.

AMC DEMAGNETIZER

A Tool Room Necessity



Every tool room needs this simple, portable, sturdy demagnetizer. Small parts passed through the powerful AMC field are instantly demagnetized. Large, flat surfaces can be demagnetized by sliding the device over the surface.

Available for either 115 V. or 220 V.

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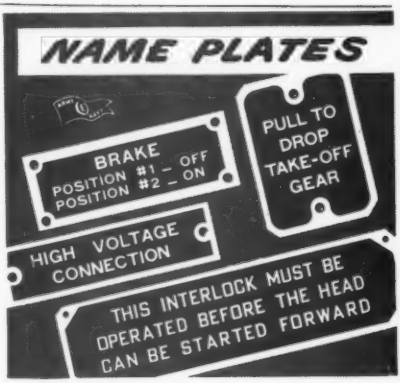
NAME PLATES


BRAKE
POSITION #1 — OFF
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PULL TO DROP TAKE-OFF GEAR
HIGH VOLTAGE CONNECTION
THIS INTERLOCK MUST BE OPERATED BEFORE THE HEAD CAN BE STARTED FORWARD

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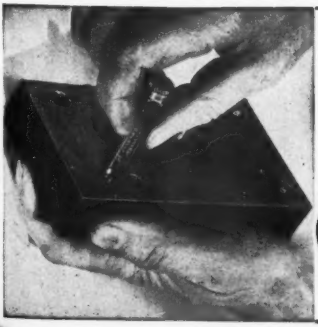

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It's a help that die makers, tool makers, machinery builders and general machinists have long sought—a more accurate and surprisingly faster way of transferring blind screw holes.

The Heimann Transfer Screw Set is a self-contained, complete tool. No wrenches or pliers are necessary. Made in 3/16" to 1" diameters.

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GREENFIELD
GRINDER SPEEDS
TOOL AND CUTTER
GRINDING

The Greenfield No. 4 is furnished either as a Plain Cutter and Reamer Grinder or Universal type with attachments for cylindrical and internal grinding. Heavy rigid construction assures precision work. Adjustable table for straight or taper grinding. Early delivery to War Plants.
Write for Bulletin No. 2 containing complete specifications.

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Dept. TJ ★ Greenfield, Mass.

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as used at the
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New Haven, Conn.

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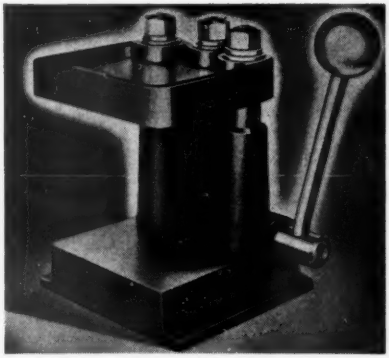
MECHANICAL INSTRUMENT CO., INC.
An Associate Company of American Chain & Cable Company, Inc.

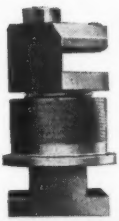
Woodworth Cone-Lok Jig

N. A. Woodworth Company, Dept. TJ, 1300 E. Nine Mile Rd., Detroit 20, Michigan, introduces a new clamping jig, the "Cone-Lok", which is of rugged construction, exceptionally safe in operation, versatile and possesses a minimum of moving parts. The Woodworth "Cone-Lok" jig is constructed to utilize the great braking power of perfectly mated male and female cones. Massive and



amply proportioned parts provide great strength and a large margin of safety over any load; the "Cone-Lok" can be converted from right to left hand operation in two minutes, using no additional parts. All moving parts operate in an oil bath, and exclusive Woodworth design keeps chips and cutting oils from contact with any of the internal parts. No movement of working parts is possible without action of the operating lever. The tray is positively clamped at any location in up or down strokes and any sudden weight or pressure applied to the tray instantly throws the second Cone-Lok into action, thus securing the tray at the original position. Three styles are being manufactured at present, the three-post as illustrated, the up-clamp type and the bridge type. The three-post type may be used for most applications found in general machine shop work. The up-clamp type is used where depth of counterbore or drilled holes must be held to close tolerances. The bridge type is necessary wherever large, heavy operations must be performed.

INFORM-A-GRAM KEY No. 926-W



A SOLID NON-CHATTERING CARBIDE TOOL HOLDER

Tool easily removed for grinding without losing set-up

- Eliminates tool chatter
- Easy to adjust for height.
- Simplifies set-up when changing tools.
- Remains solid at all times.
- No blocks or shims required.
- Minimum over hang.
- Standard sizes available.
- Hex or square heads.

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Tubular FEATHER TOUCH **MICROMETER**

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TU-MI-CO TUBULAR construction of special homogeneous grain structure steel is 25 to 50% lighter than solid frame, yet highly shock resistant. Triple plated—copper, nickel and chrome. More sensitive feel, easier to use. Low thermal conductivity—combats "walk" in measurement. Tool steel spindle with threads *ground* for accuracy. Adjustment in bushing to maintain alignment. Get TU-MI-CO precision. Prompt delivery.

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PATENTED EVANS

DUAL-SPIRAL EXPANSION REAMER

Reams to such close tolerances and satin-smooth finishes that honing is completely eliminated. Flutes spiral in opposed directions simultaneously—ideal for reaming over grooves or oil slots. Blades may be resharpened many times. .035″ to .080″ expansion range. Extensions for line jobs.

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Established 1918

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LABORATORY GRADED
PURE DIAMOND POWDERS

STAR DUST speeds up production enormously and produces finishes and superfinishes down to less than .0000004 of an inch.

Precision LAPPING POWDERS for PRECISION work

For GAUGES, TOOLS, DIES, etc., with tremendous TIME SAVING. These factors make STAR DUST indespensable in lapping and superfinishing on HARDSTEELS, TUNGSTEN CARBIDE, CHROME.

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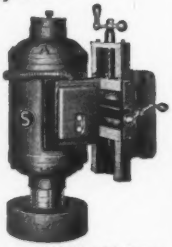
YES SIR! You can now make your machine a "double purpose" machine, the "Standard Way". STANDARD VERTICAL SPINDLE GRINDERS can be easily mounted on your Planers, Boring Mills, Shapers, Milling Machines, etc., giving you added profits! Available with or without feeds, as preferred.



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If you are seeking clean aggressive representation write us details of your products for both immediate and postwar selling. If interested we will have a representative call on you for further discussions.

Box AP-35, Tool & Die Journal
2460 Fairmount Blvd. Cleveland 6, Ohio

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This hand operated Economy Portable Lifter of combination boom and platform design is featured by the Economy Engineering Co., Dept. TJ, 2659 W. Van Buren St., Chicago 12, Ill. The platform, lowering clear to the base, raises the die to the level of the press bed. The regular standard ball bearing hoist units

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INFORM-A-GRAM KEY No. 277-W

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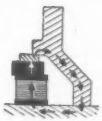

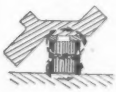

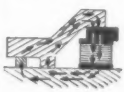

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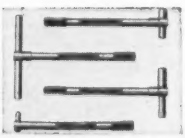

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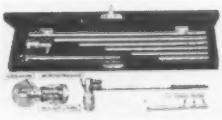

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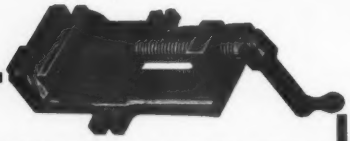

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INFORM-A-GRAM KEY No. 696.5-W

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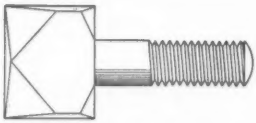

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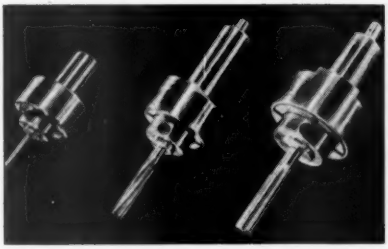

principle in the Green Reamer Holder is based on two oil-resistant, synthetic rubber rings. These allow free but controllable motion in any direction, lateral as well as pivotal. Thus a smooth round hole, free of chatter marks and without bell mouth, is produced. Once the float adjustment is set for a particular job it will not change, because there are no wearing parts or friction. With all movement of the reamer absorbed by the resilient rubber rings, shock on the cutting edge and any tendency to chatter is eliminated. A hollow set screw fixes the position of the reamer and a simple spanner which adjusts a threaded compression screw sets the tightness of float. Both these adjustments can be made with the holder in working position in the machine. Other features of the new reamer holder are the one-piece bushing which eliminates mismatching or loss of parts, and the hollow shank which allows the reamer to protrude so that no shortening and consequent loss of grinding centers is necessary. All parts are made to close limits of high quality material, carefully heat-treated, finely finished, and standardized for quick, easy replacement.

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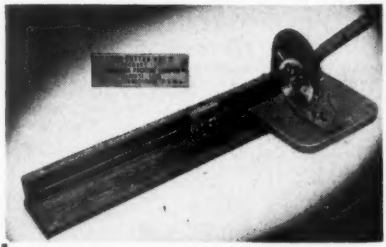

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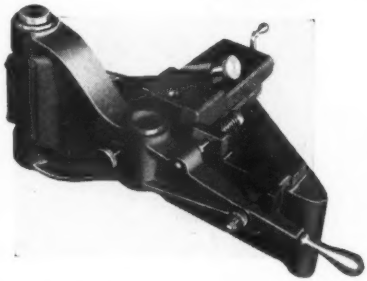

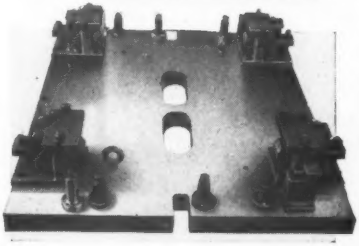

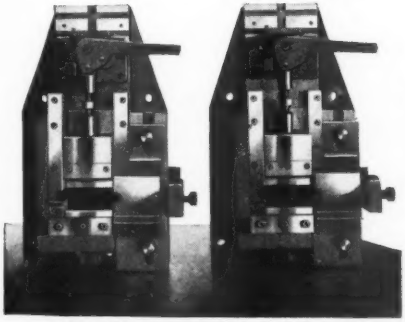

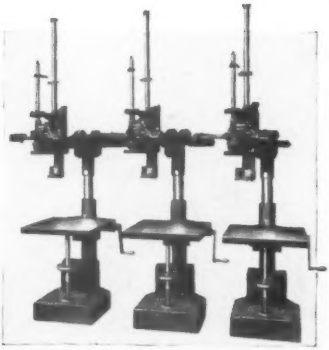

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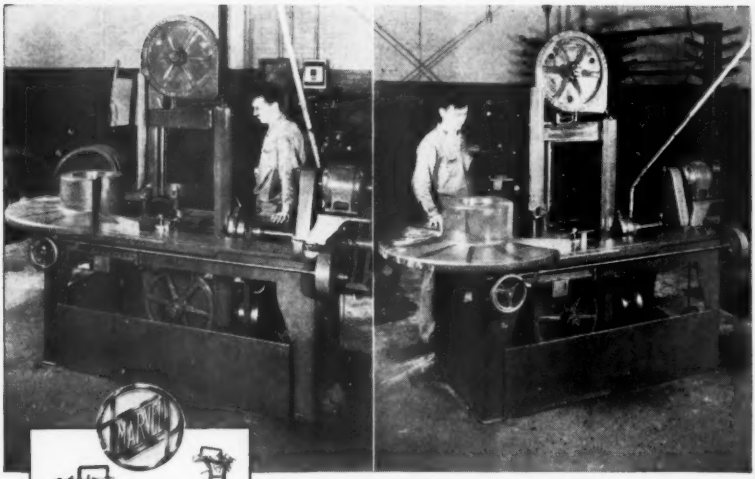

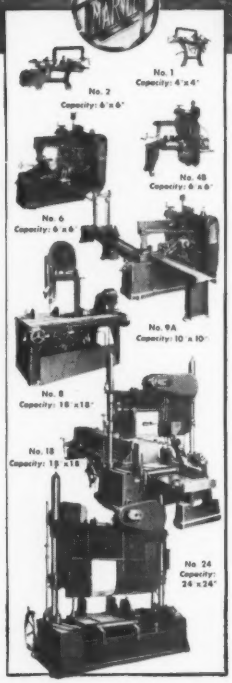

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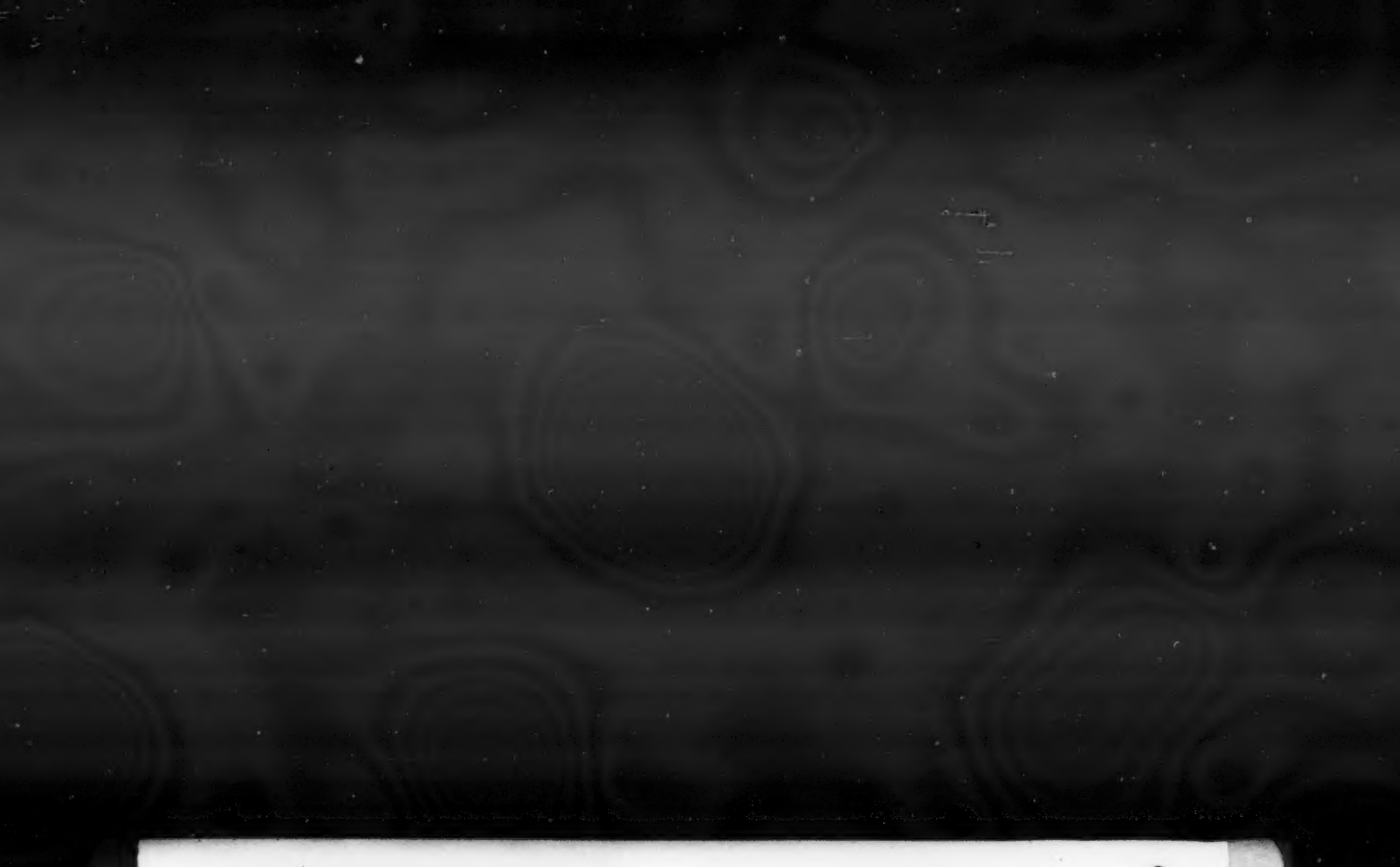
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